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HOOPING BARRELS BY MACHINERY.

Immense quantities of crude petroleum are pumped from the places of production to refineries; large quantities are transported over railroads in tanks; but all the shipped product and all that is sold for consumption reaches the consignee and the consumer in barrels; and the barrel making for petroleum and kerosene alone is enough to revolutionize the cooperage business and to invite the intervention of machinery as a help to hand insufficiency. During the year 1882, 30,053,500 barrels, of 42 gallons each, of crude petroleum were produced, and during the first six months of 1883—January to June inclusive—no less than 11,291,663 barrels were produced in this country. A large proportion of this product was barreled. And the making and keeping in order of these barrels is an important industry, the loosening of hoops by the shrinkage of the staves being no small portion of its demands.

The barreling of whisky and other liquors requires occasional coopering, particularly when the barrels are new and first used, and the materials of which they are made have not been thoroughly seasoned, or, being put to new uses, are overstrained and leak; for with this machine the hoops may be reset while the casks are full. The machine is similarly useful in originally hooping lard, pork, and beef casks, or in tightening the hoops when the staves have yielded. So in the ale and lager beer business the machine will be found similarly useful; and indeed it is intended and adapted to the efficient hooping and re-enforcing by hoops of all iron bound casks, whatever their use or whatever their contents.

The engraving on this page shows in perspective a machine that is constructed specially for driving hoops on new casks, and also for redriving hoops on casks that have once been used. The patentees sum up its advantages as follows: It will drive the hoops on from 1,200 to 1,500 barrels per day of ten hours, the barrels being either empty or full, and either new or old. The machine will do better work than can be done by hand and break fewer hoops, and its use will effect a saving of from one and a half to two cents per barrel in expense.

A brief description of the action of the machine may aid to an understanding of its construction, shown in the engraving, and to an appreciation of the claims made by its operators.

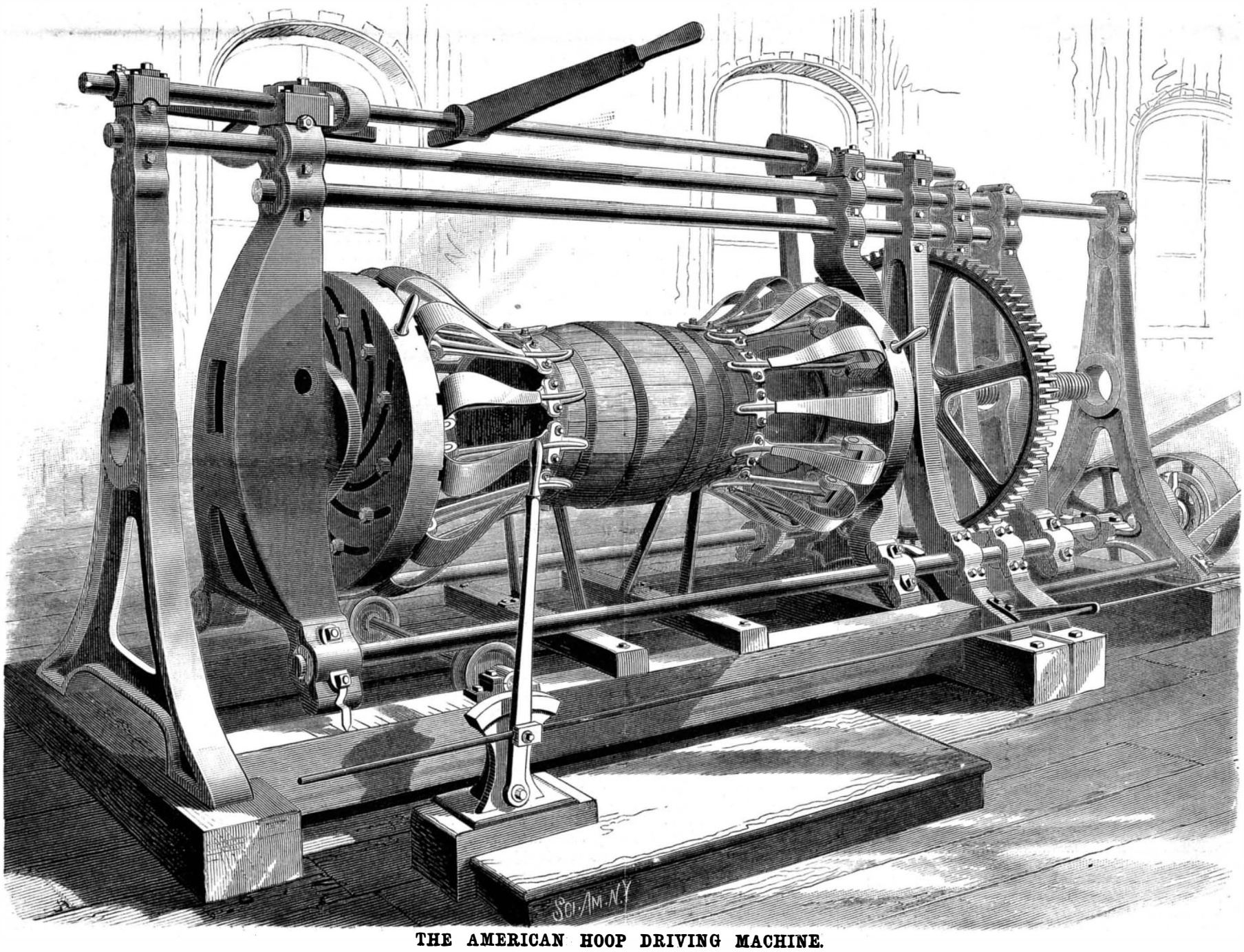
It is a solid frame, the uprights connected by timber and iron braces, or built as an entirely iron frame. Between its uprights slides, at each end, an upright frame, supported on longitudinal bars—in the engraving they are shown as round—and each of these frames supports a cylindrical disk head, to the inside faces of which are attached by pivot hinges twelve equidistant projecting jaws having dependent ends, so that they form ordinary bell cranks, held down at the top by flat springs and governed in their reflex action by a sliding double disk on their dependent or lower ends, the action of the disk being produced by a cam connected with a longitudinal rod, operated by a lever shown at the top of the machine. By pulling on this lever the jaws at each end of the machine, twenty-four in number, are simultaneously raised, the limit of this action being sufficient to allow for the bilge of the barrel and for the different sizes of barrels.

The heads themselves, with their twelve jaws each, are intended to slide forward and backward at the will of the operator, by means of a shaft driven by a gear wheel from a pinion on a pulley shaft operated by means of two belts and pulleys and a clutch and reversing bar. The shaft of the gear wheel is a right-hand and a left-hand screw of the same pitch, and while one thread pulls the thither end, or head, the other pushes forward the hither end.

The operation of hooping barrels with this machine is simple. The barrel, with its hoops loosely in place, is placed on a cradle that may be made adjustable as to height and transverse position. The jaws embracing the barrel engage with the first or end hoops simultaneously at each end by means of a lug projection on their under face; the machine is started and the hoops are pressed forward toward the center simultaneously and at all points in the circumference alike—a very different process from the hand coöpering of one blow at a time in one single spot. The result is a gradual and synchronous pressing forward of the hoops and the consequent gradual and even compression of the staves. When the first hoops are driven, the jaws are raised sufficiently to clear the hoops and the increasing bilge of the cask, and they attack the next hoop. The operation is very rapid, two barrels per minute, of six hoops each, being a low rate.

One machine may be adapted to barrels of forty-five gallons to kegs, if required; the heads, as seen in the engraving, being provided with spirally radial slots to allow the jaws to be moved from center to circumference, and they are held in place by nuts.

Further information, if desired, can be obtained by addressing the American Hoop Driving Machine Company, J. Wood, Jr., Secretary, 242 South Third Street, Philadelphia, Pa.



THE AMERICAN HOOP DRIVING MACHINE.

Covering Metal with Glass.

An exchange gives the following process for applying a glaze or enamel to metals: A mixture of 20 parts of carbonate of soda, 11 of boracic acid, and 125 of broken (flint) glass is melted and the mass poured out on a stone or plate of metal. When cold it is pulverized and mixed with a silicate of soda (water glass) solution of 50° B. The metal is covered with this paste and then heated in a muffle until it melts. This enamel is said to adhere well to iron and steel.

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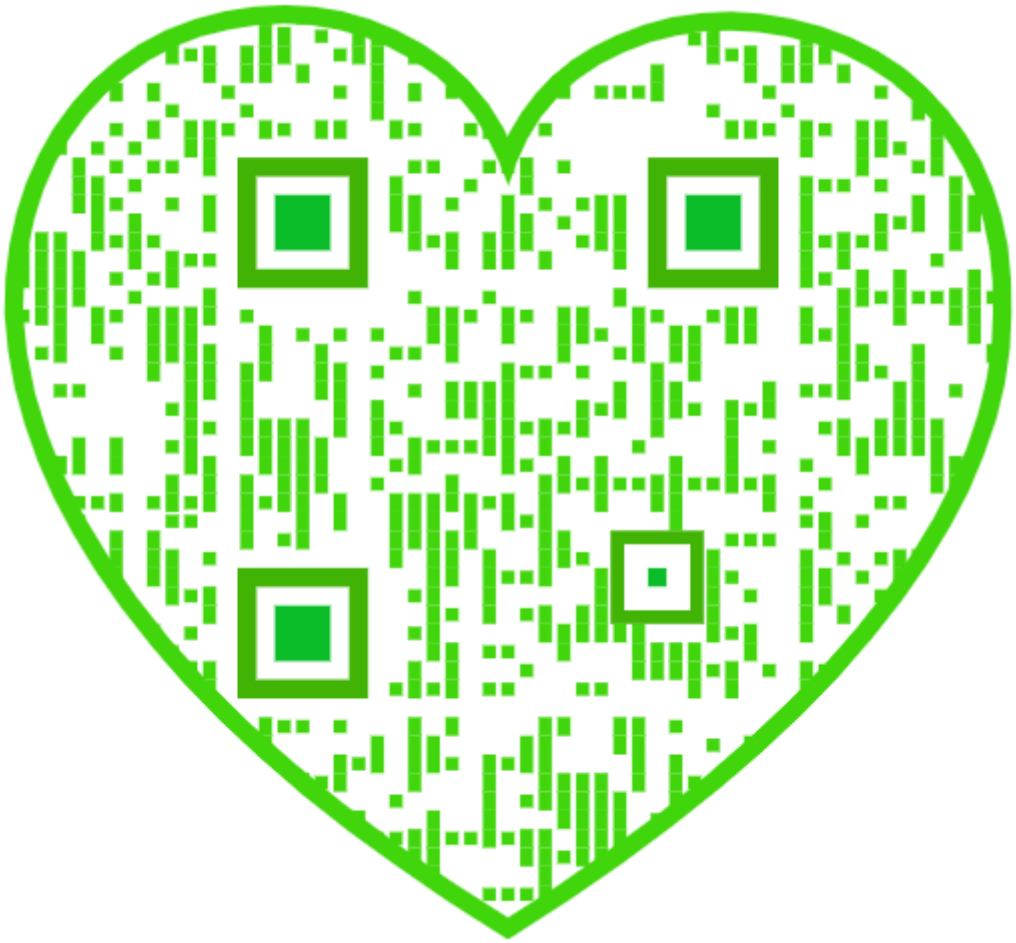

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WATER SUPPLY FOR NEW YORK CITY.

A meeting of the New Aqueduct Commission was held in New York, August 8, at which the Commissioner of Public Works presented a report describing three proposed plans for increasing the water supply of the city. The first proposition was the building of a dam and the formation of a reservoir at the lowest available point on the Croton River, and in the Croton Valley. The second proposition was to dam the east branch of the Croton at Brewster's Station.

The third plan was the construction of two aqueducts, one below the present Croton Dam and another above the dam, the object being to add to the present means of delivering the present storage supply and to increase the supply from sources not now utilized. What may be considered a fourth proposition was made by a member of the board who suggested the building of a temporary flume of wood, four feet in cross section, from the present Croton Dam to the city. Estimates regarding this plan are to be made.

But the plan that appeared to find the most favor among the members of the commission, was that of Mr. Isaac Newton, the Chief Engineer of the Croton Water Works, a plan which has been indorsed by seven of the most prominent hydraulic engineers in the country. This is the first proposition, the building of a dam at the lowest point in the Croton Valley at "Quaker Bridge," the reservoir to have an area of 3,635 acres, the water level to be nearly 34 feet above that of the present Croton dam.

The additional watershed thus utilized will be 23 square miles, and the estimated daily increase of water over the present supply will be about 20,000,000 gallons, making a minimum supply for the city of 250,000,000 gallons. The total cost of the dam, land damages, and the new aqueduct, 31·89 miles long, and of circular area of 12 feet diameter, will be as estimated about $14,500,000; but other outside estimates put the cost of this job at $30,000,000, and claim that its construction will be attended with serious dangers; that its success is problematical; that the only sure thing about it is the enormous load of debt which it will entail upon a city now overloaded with indebtedness; and that any one of the other suggested plans would be better, far cheaper, quicker in furnishing the required water supply, and equally effective for permanent use.

THE CARSON FOOTPRINTS.

Dr. D. W. Harkness read a lengthy paper before the San Francisco Academy of Sciences, on August 6, on the foot marks found in the quarry at Carson, Nevada, some of which resemble those of a biped and have been referred to prehistoric man. To this belief Professor O. C. Marsh expressed a doubt, referring the footprints rather to those of a gigantic sloth, and giving, as one of his reasons for that opinion, the fact that the spread (straddle) of the lines of footsteps was abnormally large for those of man, being eighteen inches, while the length of stride or step is but little over thirty-eight or thirty-nine inches, hardly more than a vigorous stepping six footer of the period would make.

To this principal objection, and other minor ones, Dr. Harkness gives a series of descriptions of the padded surfaces of walkers, from wading birds to springing quadrupeds, and shows that while the bipedal tracks are no less than 400 in number in a series of eight, representing probably so many individuals, they are all similar in character and have no intimation of pad, nail, or talon; but they are crossed and recrossed by well defined tracks of the elk, horse, wild dog or wolf, mammoth, deer, the leaping tiger, the heron or the crane, a web-footed bird, and that of an unidentified quadruped with broad hoofs, sharp pointed at the toes. These all can be classified, but the bipedal tracks in dispute differ from all in showing no natural foot characteristics of structure.

Dr. Harkness' conclusion is that the tracks are those of progenitors of the present human race, and he has given them the title of the "Nevada Man"—*Homo Nevadensis*. The feet that made the impressions were shod with sandals, in one instance of wood and in others of rawhide or other yielding materials. They vary in size from fourteen to twenty inches in length, with an average breadth of about eight inches. Arrangements have been made by the California Academy of Sciences for taking plaster casts of the footprints now exposed, and they are so valuable in palæontological research that the Smithsonian Institution at Washington, the National Museum at Paris, and many other eminent scientific societies have applied for duplicate casts. An area forty-nine feet by eight is to be cast in sections.

HARD WOOD FLOORING.

The use of beech, birch, and maple has been restricted to a few specific purposes, but the example of the builders of the new Flint Mill at Fall River, in flooring with these woods, will probably be followed by others. The narrow Southern pine planks that have been so long and extensively employed for flooring require to be culled with great care to insure an even floor. They must be straight grained, or they will bend and splay by use, splintering into short slivers dangerous to the feet, and collective of all the fluff and fibrous dirt with which they come in contact. The heart of the pine is especially open to this objection. But a beech or maple floor will wear evenly and smoothly, and has greater endurance for heavy rolling weights than that of the Southern pine. It is more cleanly, and is not so readily inflammable.

The birch when properly seasoned under cover, or kiln dried at a heat not sufficient to vaporize its contained oil, makes a durable and evenly wearing floor. This cheaply estimated wood is really elegant also for furniture purposes. It shows well in cabinet work alternated with maple or apple, and it is fully as valuable for drawers and chests in defending the contents from moths as is the red cedar. The best qualities of birch timber come from the black birch or the yellow birch, the white birch wood being too open or porous for fine finish or durability; and the yellow and black birch grows also to a larger size generally.

The New York *Evening Post* says that the new building of the Pacific Mills at Lawrence, Mass., is to be floored with hard wood, some 300,000 feet to be used, and that other mills throughout Massachusetts, Rhode Island, and Connecticut, have also ordered this hard wood flooring, and it is very evident that Southern pine flooring will find a serious competitor. A good hard pine mill floor board, free of sap and coarse knots, will cost about $28 per thousand feet in large lots, according to the quality, while hard wood flooring will cost from $30 to $32 per thousand feet all dressed and delivered.

HOW GRANITE COLUMNS ARE POLISHED.

The word "granite" generally conveys the idea of roughness, coarseness, and solidity. The idea of finish, smoothness, and polish does not, in the popular mind, belong to the material. But most kinds of granite are susceptible of a beautiful and almost faultless surface finish. The effect of this finish in contrast with the hammered faced granite, on monuments where a tablet is surface polished, or lines of lettering are in brilliant contrast with the dull gray of the unpolished stone, is very fine, especially so when the shafts of columns are thus finished, the bases being hammered and the capitals carved. As this finish can now be obtained by machinery at a low cost, the possibilities of obdurate granite for ornamental as well as for building purposes have been greatly enlarged.

Granite columns, vases, and similar cylindrical ornaments are polished in a lathe. This differs but little from an ordinary machinist's lathe, except that a continuous bed is not necessary to hold the lathe heads, that the spindle of the foot-stock revolves as well as that of the head stock, and that no tool carriage and appurtenances are required. The head-stock is furnished, like that of the ordinary back-geared lathe, with a back shaft, on which is the driving pulley, or the cone of step pulleys, from which the spindle is driven by means of a gear and pinion, the surface speed of a column under process of grinding and polishing being from 230 to 240 feet per minute, giving to a twelve-inch column about 77 turns per minute, and to a thirty-six inch column about 25 turns per minute.

To center and swing a column in the lathe the stone has a square recess cut each end, into which is fitted a block of cast iron with round hole through its center. The place of this block is found by means of a cross of wood with sliding arms on each of the four limbs of the cross, the arms projecting over the surface of the column longitudinally, and when equidistant from the center denoting the place of the center block, so that the true center of the column or shaft is found, just as it is on an iron shaft, from the circumference. The iron block is secured in place by a running of Babbitt metal, or a similar unshrinking compound, around it. The centers of the lathe spindles fit the holes in the blocks, and when swung in the lathe the column is rotated by means of a lug or dog on the face plate engaging with one seated in the end of the column.

Back of the lathe is a wall of plank against which rest the ends of a number of iron blocks, three or four inches diameter, long enough to project over the column and to have their rear ends resting against the bulkhead or wall. Their under sides are concaved to embrace the column one-fourth of its diameter or less, and as the motion of the column in grinding is reverse to that of the ordinary lathe, the blocks are held against the wall by the rotation of the column. These blocks are arranged closely side by side, and when the column is first worked its irregularities of chiseling and unevenness of contour make these blocks play up and down like the movements of pianoforte keys under the fingers of a performer. But as the grinding progresses this irregular movement becomes a very slight undulation, pleasant to see.

A trough runs under the column its entire length, and from it an attendant shovels beach sand and water on the revolving column, the blocks with their concave faces acting as grinders, just as the hinge clamps of the machinists are used in polishing a turned shaft. And like the clamps, the series of blocks are occasionally pushed along one-half of their width to avoid rings of roughness. This quartz sand is used until all the bruises, "stunts," and chisel marks are taken out, and the surface shows a uniform color. Then the trough is cleaned and emery of the numbers 40 to 60, according to the quality of the stone, is weighed out in the proportion of about half a pound to every superficial foot; thus a column of ten feet in length by three feet diameter—ninety superficial feet—would require from 45 to 50 pounds. This is all weighed out at one time, and is never added to during the entire process. Mixed with water, it is fed to the grinders by the shovelful, over and over, until the grinding is entirely completed. The reason for this is evident from the fact that, in using, the emery becomes ground up and mixed with the *detritus* of the granite and the particles of the iron blocks or grinders, and after a time is a pasty mass losing much of its original sharp grittiness. If,

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now, fresh, unused emery was added, the effect would be to scratch the half finished surface.

When the grinding is finished the common cast iron grinding blocks are removed and others are substituted having their embracing under sides faced with felt. To these is fed the ordinary marble polish of oxide of tin and water until the surface of the column shines like glass and reflects like a mirror. The entire time required to polish granite columns—dependent on the exactness of their chiseling—is from 40 to 50 hours, diameter and length making but little change, as the work is simultaneous and the surface speed a constant.

PALESTINE AS A ROUTE FOR A NEW SHIP CANAL.

The recent agitation for the building of an additional ship canal between the Mediterranean and the Red Sea has brought up for renewed consideration the project of building a canal through Palestine, commencing on the seashore at Acre, thence inland across the plain of Esdrælon, to the northerly end of the river Jordan a distance of about 25 miles, thence down the valley of the Jordan into and through the Dead Sea, about 150 miles, thence southerly along through the sands of the Waddy Arabah, about 100 miles to the head of the Gulf of Akabah, an arm of the Red Sea—in all about 275 miles. Mr. H. J. Marten, C. E., in writing to a member of Parliament on the subject, says:

"The crucial point, with reference to the project is that which relates to filling the immense depression in the valley of the Jordan with water up to the sea level, by means of a channel to be formed from the northern end of the Gulf of Akabah, along the Waddy-Arabah to the southern end of the Jordan valley depression.

"To fill this depression with water and to convert it into an inland sea of the same level as the Mediterranean and the Red Sea, in a period, say, of three years from the completion of the requisite channel, and to make at the same time due provision for evaporation, this southern channel would have to be large enough to convey over 1,000,000 cubic yards of water along it per minute during that period.

"To pass this quantity of water it is estimated that, with a fall at the rate of six feet per mile, this channel would have to be 480 yards wide and 20 feet deep, and it is assumed that a channel of this description may be cut through the loose sand which is said to compose the southern end of the Waddy-Arabah by means of the properly directed scour of an elementary channel having a bottom width of 50 feet, and carrying a solid body of water 10 feet in depth to begin with."

THE CHINESE JUNK.

JOHN R. CORYELL.

It would not be difficult by a judicious combination of philology and fact to apply the theory of evolution to Chinese naval architecture, and reach the war junk by a series of easy steps, beginning with the boat called the "sampan," for the sampan—literally three boards—is simple enough in construction to satisfy any reasonably exacting person that it was the primitive boat.

Evolution in this case, however, is unnecessary. Chinese annals furnish the cold statement that ship building was introduced into China by Ta Yu, the founder of the Hiaki dynasty. As this emperor reigned about twenty-two hundred years before the Christian era, it will be seen that the junk of China must antedate not only the celebrated Argo, but even the ark of Noah.

Cut up as China is by a great number of natural and artificial water courses, and having a long line of sea coast, it is only natural that the vehicles for water locomotion should assume a great variety of forms. Some of these forms prevail, with modifications, from one end of the empire to the other, but there are a number of boats that owe their origin to peculiarities in the needs of the people, and to the character of the streams upon which they are to be used, and are therefore purely local in design.

A striking example of the results produced by the character of the stream to be navigated is found in certain parts of the province of Nganhwui, where there are several rivers at once so shallow and so full of dangerous rapids that the ordinary boat is found to be useless. Peculiarly shaped rafts are used. The bow is turned up in a graceful curve, and the thin but tough structure, when once well laden, skims over the surface of the water or glides over protruding rocks with comparative ease and safety. These rafts are not much used by passengers, partly because of the giddy voyage they take, and partly because the water is frequently as much over as under the craft.

The most important as well as the most imposing of Chinese boats is the ocean-going war junk. This is the typical Chinese craft, inasmuch as it is constructed in such a manner as to present to the eye of a foreigner, at least, the very exaggeration of what he is accustomed to regard as peculiarly Chinese characteristics in naval architecture.

The poop and bow are exceedingly high and broad, and though the bulwarks are of good height, too, they seem low by comparison. The port-holes are usually of pentagonal shape bordered by a strip of red. The masts are three in number, and from the top of the main-mast streams a strip of red cloth fastened to the tail of a dolphin-shaped vane, and reaching almost to the deck. The safeguard of the junk is a flag fastened at an angle to the mainmast. This flag bears upon its surface a representation of the two great principles, the Yin and the Yang, or, translated, the male and the female principles. There are also on the flag other favorable devices to secure good luck for the vessel. A triangular flag is displayed at the stern. Two great eyes in bass-relief, painted in black and white, ornament the bow.

Although tub-like, and very different in model from our modern clippers, the Chinese junk bears a striking resemblance in general outline to European vessels of several centuries ago. It is supposed that the original model of the junk was some great sea monster, fortunately no longer met with. The outlines of resemblance to this fabulous creature are traced somewhat in this wise: The teeth on the cutwater define the mouth; the long boards which project beyond the bow, and on which the eyes are painted, represent the gills; the masts and sails are the fins, and the high stern is the tail flourishing aloft.

Instead of being laid out by means of decks into long compartments, running the length of the vessel, the hold is cut up into a series of water-tight spaces, by wooden bulkheads. In this, as in the matter of the compass, it would seem as if the Chinese had taken the lead of the European. The Chinese claim, as is well known, to have made use of the mariner's compass as long ago as twenty-six hundred and thirty-four years before our era. It is difficult to understand, however, just what use the mariner's compass could have served more than four hundred years before ship building was introduced.

Each mast is frequently of one solid piece of timber. The sails are usually made of matting, though cotton is sometimes used, and are strengthened at intervals by poles stretched across the entire width, thus precluding bending to the wind, and giving the set sail that peculiar ribbed appearance so suggestive of China. The rigging is of rattan, bamboo, hemp, or cocoanut fiber. The enormous cables are most often made of rattan.

Owing, perhaps, to the peculiarity of the rigging, and to the fact that no square sails are used, the junk is unable to sail to windward, though it frequently attains a remarkable speed when sailing before the wind Another odd feature of the junk is the seeming effort to make the rudder supply the lack of keel. There is almost no keel at all, but the rudder is of enormous size. It is naturally not easy to work such a rudder, and consequently to facilitate its passage through the water it is perforated in a number of places.

To be a sailor is to be superstitious. To be a Chinaman is to be superstitious. What then is it to be a Chinese sailor! From the time the keel of a junk is laid until the vessel goes to the bottom, where all junks seemingly do go eventually, prayers and spells are employed in its behalf. Mid spells and incantations a lucky day for launching is chosen. A shrine to the goddess Tien-how, the tutelary deity of the sailor, is carried in every junk. Propitiatory sentences and prayers are inscribed on various parts of the vessel.

Notwithstanding the use of all these preventives, however, storms will overtake the junks. Instead of then blaming the goddess, or losing faith in the efficacy of the spells showered about the craft, the sailors usually search among themselves for a particularly wicked fellow. If such a one be found, he is likely to be tossed overboard as the cause of the trouble.

Although the most imposing, the war junks are by no means the largest of Chinese craft. The merchantmen are sometimes built of very great size, with a carrying capacity of several thousand tons each. Some of them carry five masts, two of which, however, are hardly worthy of the name. One of these is lashed to the side not far from the bow and forward of the foremast. The other is very small in size, and is placed between the main and mizzen masts.

These very large junks, while in most particulars like the war junks, have some interesting peculiarities. The bow and stern are built of unusual height, and bulwarks are entirely lacking. The consequence of this arrangement is that in a high sea the decks amidships are continually swept with water. For the safety of the sailors a light rail of rope is passed across the gaps where the bulwarks should be. The hatches are protected from the wash of waves by coverings, light but strong.

To heave to or bring the head of such a clumsy craft as this to the wind in a heavy gale is no trifling matter, and by ordinary means would be impossible. The device adapted by the Chinese sailors is simple and crude, but effective. A large, stout basket, so attached to ropes that it will hold a fixed position, is thrown over the side to the windward. After a sufficient length of rope has been allowed it, it is permitted to drag. The effect is precisely that of a loaded parachute in the air. The head of the junk is brought up to the wind quite as effectively as if anchored. And in a shifting wind, such as is common in the China seas, no doubt the basket is superior to the anchor.

Each trading vessel is obliged to have its name painted or otherwise delineated on the stern, and must bear a plain indication on its sides of the province from which it hails. This indication is usually the color which the bulwarks are painted. As this paint must by law be renewed every two years, it is a fairly easy matter, in passing a junk at sea, to determine from what part of the empire she hails Instead of naming their vessels from persons or objects, the Chinese merchants endeavor to beguile success by presaging it. "Bountiful Return" and "Golden Profit" are fair examples of the names of junks.

The Chinese sailor has been spoken of as unusually superstitious. A recital of the variety of odd practices resulting from this trait would fill a volume; but there is one practice, which, as it passes the bounds of mere oddity, and is, moreover, fraught with great danger to himself and foreign vessels as well, may be specially noticed.

For some reason, quite as fantastic in proportion no doubt as its outcome is dangerous, the master of a junk finds it a joyful and luck chance that enables him to cross the bows of a foreign vessel. Time and again have the foreign steamers plying on the great rivers and seas of China cut down unfortunate junks which were endeavoring to accomplish this strange feat. Disaster teaches no lesson, apparently, for the practice is still continued.

As an account, no matter how brief, of our naval architecture which did not at least mention the Great Eastern would be considered incomplete, so it will be only just to glance at what Chinese history has to say of a similar shipbuilding work accomplished in China. As the Chinese historian, however, does not make the same nice distinction between fact and fancy that is considered necessary with us, due allowance must be made in accepting the statement.

It was nearly a hundred years before Columbus, in his tiny craft, was venturing away from the sight of land that Ching-ho, a mighty warrior from an interior province, received orders from his emperor to build him some ships and in them carry a large army to foreign lands, partly to overawe the small portion of the world outside of China, and partly to take prisoner the fugitive but rightful ruler of the Chinese. Ching-ho, without loss of time, built sixty-two ships, each four hundred and forty feet long and one hundred and eighty feet broad.

This is certainly a better story than we can tell, for though the Great Eastern was one-half longer than these junks, she was only one-half as broad, added to which is the fact that Ching-ho built sixty-two vessels instead of only one.

The Louisville Exposition.

The Louisville *Courier*, August 9, referring to the Exposition, laments over the fact that there has been so much delay in getting their exhibits in place and the show in running order, but adds:

The great engines which are to furnish the power to drive all the machinery are one by one getting down to work. In a few days the extensive display of the textile machinery will have power applied, and the never-ending wonder of changing the fleecy staples into yarns will begin.

Last night the electric railway was in operation, and the locomotive with two cars attached made the tour of the park. To-day it will be running constantly, and visitors will see what is the latest achievement of science. It is an event of extraordinary interest. It is the practical demonstration of the power of electricity applied as a motor. Without fire or smoke, with no visible agent to propel it, moved by an unseen and even as yet an almost unknown influence, it follows the path marked out with all the celerity and certainty demanded by the most cautious and practical.

The *Courier* passes flattering encomiums on the loan collection of paintings in the Art Gallery of the Exposition, and suggests that there has never been such a gathering before in America.

The Jarvis Furnace in the Sandwich Islands.

Messrs. Charles Brewer & Co., Honolulu, Sandwich Islands, have taken the agency of the Jarvis patent furnace for that section of the world. They have just taken a contract to reset over a large number of boilers with the Jarvis furnace to burn wet sugar cane trash for the Waulukulu Plantation, on the island of Monia. This is the second order from this plantation. The wet weather during the grinding season prevents the drying of the sugar cane trash after it comes from the grinding mill.

Wood is very scarce, and coal from England costs about $20 a ton. By setting boilers over with the Jarvis furnace this wet fuel can be utilized and the cost of making sugar reduced materially.

Topographical Uses of the Balloon.

The recent balloon trip of Crespigny and Simmons across the English Channel has given occasion for the latter to send to the Pall Mall *Gazette* some facts of the voyage, with a suggestion of the usefulness of the balloon in making topographical surveys. In his account Mr. Simmons says that "not only the land lay below us like a map, but the bottom of the sea is clearly seen in every direction. Every channel and shoal is easily marked, and forms a fibrous network. By the aid of instantaneous photographs there would be no limit to the increase of our knowledge of the sea through balloons, as charts of greater exactness than any yet existing could be made of the bottom of the sea, at least of shoals shallow enough to offer danger to sailing crafts."

Sparrows as Food.

The English sparrow, where he has become habituated, is usually regarded as a nuisance to be abated or a pest to be extirpated. Indeed, one State, Massachusetts, has enacted a statute against these small birds, to encourage their thinning out, if not their extermination. Whatever may be the value of the sparrow alive, there is but one opinion about him when dead. The sparrow—or plenty of him—makes delicious pies. In Germany and in England the sparrow is a game bird, and is sought after as food. He is so tame that his capture requires very little skill, and after grain gathering in August he swarms on the stubble so that one charge of fine shot would bring down a number of birds.

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The Possibilities of Mexico.

A correspondent of the *Anglo American Times*, writing from Monterey, Mexico, says:

"They are waking up in Mexico. On the whole, it is a matter for surprise that the railway invasion of Mexico has been so long deferred—so much is there in the land to tempt what is known in the States as "railway enterprise." In raw materials the country is very nearly as rich as the most enthusiastic of its prophets claim that it is; which is saying a great deal. Mexican hard woods—save those of the coast forests—practically remain untouched. The large possibilities of sugar manufacture from the sap of the maguey—the *agua miel*, from which *pulque* is made—are absolutely undeveloped, although there can be no doubt but that this material is destined to play a very important part in the world's sugar supply. Another product of the maguey species (*Agave americana*) that is but little used is the beautiful fiber of the leaves, *ixtli*.

"Ixtli obtained from henequen, another variety of maguey, is exported in considerable quantities to London and New York for use as body material for carpets. So profitable has this export been, that solely because of it one railroad has been built between Merida and the port of Progress, and another road is now nearly completed that parallels the first. Yet in the *pulque* regions thousands of tons of this fiber is burned every year simply in order to get the dead plants, from which the juice has been extracted, out of the way. For many purposes ixtli is equal to the best Manila hemp. It makes an exceedingly light, tough cordage, an excellent bagging, and a quality of paper that is as tough as linen paper and nearly as fine. The exhibit of maguey paper at the Centennial Exhibition at Philadelphia (from mills near the city of Mexico) was especially commended by the judges of awards for its toughness and smoothness of texture. Yet outside of Mexico paper makers know nothing of this material, and the manufacture in Mexico is but trifling."

After speaking of other vegetable productions, the writer says that "for the want of pumping machinery valuable porperties have been abandoned by their Mexican owners while actually in bonanza. And so imperfect is the working of the ore by native processes that the tailings in many cases can be worked over again at a profit. But," says the writer, "in regard to Mexican mines, as in regard to mines the world over, the fact must be borne in mind that no property is more treacherous or more hazardous to deal with. On the whole, a much safer investment of money in this country, and one that will give quite as satisfactory profits as successful mining, is the development of any one of the country's many other natural resources. Simply in the making of maguey sugar and in the preparation for market of the wasted maguey fiber, there are fortunes to be made."

Habits of Ants.

Rev. H. C. McCook, of Philadelphia, recently delivered a lecture upon "The Homes and Habits of Ants" before the Detroit Scientific Association and Griffith Microscopical Club, in which, according to the Kansas City *Review*, he gave some very graphic and interesting details, paying many high compliments to the ant for industry, intelligence, cleanliness, engineering skill, and various domestic virtues, among which the reporter selected the following: "Before marriage the female ant has wings, which are merely ornamental, and on becoming a matron she tears off these ornamental wings with her mandibles, and plunges into the ground, where she devotes her life to sober domestic duties, for which such gaudy attire would not have been suitable. All the work and all the fighting are done by the females and neuters. The males have no mandibles with which to work or fight, and so don't amount to much."

Vacation Visits.

One of the principal advantages of vacation outings is that of change—change of companionship, change of scene, change of food, and change of air. To some the scenes and associations and breathings of the seaside are a grateful change. To others the dim forests, the balsamic air of piny woods, the breezy perches on the mountain top, are the necessary changes to give a new impetus to the sluggish blood and new ideas to the tired brain. In either case a sense of rest and freedom from care must accompany the change of locality, or all the benefit of the effort is lost. The "shop" must be left behind.

But the air and sun are the great curatives. The seaside goers imagine that the surf bath is the reason and secret of restored energy; but they give too little credit to the open-eyed sun and free blowing air of the seashore. An air bath and sun bath have as much to do with renovation of jaded human frames as the direct contact of salt water. The Philadelphia *Ledger* says that "the tonic influence of the salt air is, at least, equal to that of the bath, and it may be superior. At the seashore a large proportion of the daily life of the visitor is out door life, as contrasted with the indoor habit of many (and, indeed, most people) during the rest of the year. There is that health giving change to begin with. The visitor has more fresh air. Then, as to the air itself. First, it is free from the many impurities that more or less pervade the atmopheres of large and densely compacted cities; the products of combustion thrown out from hundreds of thousands of chimneys; the exhalations from a crowded population; the gases from factories, laboratories, culverts, closets, and various other sources of contamination that need not be recited here. Second, the shore air, almost exclusively from the sea, bears wholesome, natural elements with it, so subtle and penetrating that their precise individual influence cannot always be traced, but we know what the effects are in their health renewing combination."

NEW LIGHTHOUSE AT TAMPICO.

On the 5th of February last the new iron lighthouse, built at Pittsburg, Pa., for the Government of Mexico, was inaugurated at Tampico. Our engraving is from *La Ilustracion*,

NEW LIGHTHOUSE AT TAMPICO.

of Madrid. The new light is located on the left bank of Tampico River, at the mouth, latitude 22° 16′ N. and longitude 98° 2′ W. The light is 140 feet high, dioptric of the second order, white light, triple flash, thirty seconds interval, visible 28 nautical miles.

Considerable difficulty was experienced in constructing the foundation, owing to the sandy nature of the ground. The work was done under the superintendence of the well known Mexican engineer, Don Ramon de Ibarrola; Resident Engineer, Don Emilio Lavit; Master of Works, Don Ramon Castello.

The Prevention of Accidents.

Many of the accidents to limb and life by machinery occur from carelessness—the carelessness that comes from ignorance, or the carelessness that comes from familiar knowledge. Persons unfamiliar with the remorseless exactness of machinery seem to imagine that it can be played with, or tampered with, or that it will relax its awful and irresistible force on appeal. These are they who should be protected while among machinery. And for their benefit, as well as that of the daily operatives, almost all the machinery now constructed, that may be approached, is defended by simple devices. Trains of gears are not now left exposed, nor are belts and pulleys open to the injudicious curiosity of the visitor. Yet safeguards are almost as necessary for the mechanic, the operative, and the manager as for the inexperienced curiosity seeker. The proprietor of a sawing and planing establishment, while "ripping up" some furring cut off a finger. When he returned he cut off two others, all within a month. He was careless from familiarity. Another, an intelligent mechanic, undertook to show some visiting friends the uses of the buzz saw, and was trying to explain to them the reason why the toothed portion of the saw was invisible while in motion, when he lost a finger by not giving his imaginary invisible radius of the saw a proper and respectful distance. Guards to circular saws and to revolving pulleys and rapid belts and grinding gears are possible, and if not made by the builders of machinery, or placed by the users of machinery, they should be enforced by the law, as a protection to the ignorant and the familiar, for the visitor and the operator.

Carbolic Spray for Sheep.

The *Australian Medical Journal* for April, 1883, contains a report by Mr. G. Lydiard upon the "Particulars and Method of Using the Carbolic Spray for the Cure of Sheep Affected with Lung Worm." A fumigating house, built specially for the purpose, was as airtight as it could be made. In it there were two rooms, each thirty three feet long, seventeen feet wide, and six feet and a half high, affording capacity for three hundred lambs. The solution of carbolic acid to be sprayed was first made of a strength of 1–30, afterward 1–20. Subsequently "Calvert's carbolic No. 4," in proportion of 1–1, was used. The spray, produced by compressed air machinery, was thrown into each room by four jets. It was so fine that it mixed at once with the air, scarcely any falling to the ground in a mist. One pint of carbolic acid was used to each room. When the spraying began the sheep moved about a little, but soon became quiet and stood with their eyes shut, chewing the cud. They were kept in the spray half an hour. No sheep have been lost by the process; on the other hand, they almost ceased to die from the lung worm disease, and rapidly improved in condition.

Economy of Coal in Locomotives.

The American Railway Masters' Association have adopted a report on the matter of the economy of railway running as regards fuel, which proposes to keep an account between engineer and fireman of a train and the coal consumed on a trip. The object is to induce the engineer and fireman to use care in the fuel, and to that end a premium on savings is offered. The plan, in brief, is to charge the coal to the engineer and fireman on a basis of miles run and load drawn, the comparison of effort to be made with the usual or average work on the road under similar circumstances.

Of all the saving above that average, the engineer and fireman to receive one-half. The idea is a good one, but the details will make the plan too intricate for general adoption; it will be found that no general rule can be adopted that shall apply to freight and passenger trains and to those "rounds" which are run by relays of engineer, fireman, brakeman, etc. And the intricacy of accounts with each engineer and fireman, and with each train they may run, will prevent the adoption of a general system. Encouragement may be given to engineer and fireman of any run by offering a percentage on saving of fuel on their run as compared with their own expenditure or that of their predecessors.

Seasonable Advice to Bathers.

The Royal Humane Society, in its recently issued report, gives the following advice to swimmers and bathers: "Avoid bathing within two hours after a meal. Avoid bathing when exhausted by fatigue, or from any other cause. Avoid bathing when the body is cooling after perspiration. Avoid bathing altogether in the open air if, after having been a short time in the water, it causes a sense of chilliness with numbness of the hands and feet. Bathe when the body is warm, provided no time is lost in getting into the water. Avoid chilling the body by sitting or standing undressed on the banks or in boats after having been in the water. Avoid remaining too long in the water; leave the water immediately there is the slightest feeling of chilliness.

SOME one who has tried it says it is a good plan to burn sulphur in cellars where milk is kept, especially if they are damp. The sulphurous acid evolved destroys the mildew, which, if not checked, will injure the flavor of cream and butter. In many damp cellars the mildew wastes the cream so that the butter product is seriously decreased, besides the injury to quality.

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India-rubber in Brazil.

In the early morning, men and women come with baskets of clay cups on their backs, and little hatchets to gash the trees. Where the white milk drips down from the gash they stick their cups on the trunk with daubs of clay, moulded so as to catch the whole flow. If the tree is a large one, four or five gashes may be cut in a circle around the trunk. On the next day other gashes are made a little below these, and so on until the rows reach the ground. By eleven o'clock the flow of milk has ceased, and the *seringueiros* come to collect the contents of the cups in calabash jugs. A gill or so is the utmost yield from each tree, and a single gatherer may attend to a hundred and twenty trees or more, wading always through these dark marshes, and paying dearly for his profit in fever and weakness. Our *mameluca* hostess has brought in her day's gathering—a calabash full of the white liquid, in appearance precisely like milk. If left in this condition it coagulates after a while, and forms an inferior whitish gum. To make the black rubber of commerce, the milk must go through a peculiar process of manufacture, for which our guide has been preparing. Over a smouldering fire, fed with hard nuts of the *tucuma* palm, he places a kind of clay chimney, like a wide mouthed, bottomless jug; through this *boiao* the thick smoke pours in a constant stream. Now he takes his mould—in this case a wooden one, like a round bladed paddle—washes it with the milk, and holds it over the smoke until the liquid coagulates. Then another coat is added, only now, as the wood is heated, the milk coagulates faster. It may take the gatherings of two or three days to cover the mould thickly enough. Then the rubber is still dull white, but in a short time it turns brown, and finally almost black, as it is sent to the market.

The mass is cut from the paddle and sold to traders in the village. Bottles are sometimes made by moulding the rubber over a clay ball, which is then broken up and removed. Our old fashioned rubber shoes used to be made in this way. Twenty million pounds of rubber, valued at 6,000,000 dollars, are annually exported from Para in the dry season; many thousand people are engaged in gathering it. But the business altogether is a ruinous one for the province, as Brazilians themselves are fully aware. The *seringueiro*, who gains two or three dollars for a single day's gathering, has enough, as life goes here, to keep him in idleness for a week; and when his money is spent, he can draw again on his ever ready bank.

The present wasteful system is spoken of as follows: The half wild *seringueiros* will go on submitting to impositions and dying here in the swamps, until Brazilians learn that by purchasing this land from the government and planting it in rubber trees they can insure vastly larger profits, and do away with the evils of the present system. It is what must eventually be done. The rubber gatherers, in their eagerness to secure large harvests, have already killed an immense number of trees about the Para estuary; they have been obliged to penetrate farther and farther into the forest, to the Tocantins, Madeira, Purus, Rio Negro, and eventually even these regions must be exhausted, unless they are protected in some way. The trees, properly planted and cared for, will yield well in fifteen years, and, of course, the cost of gathering would be vastly reduced in a compact plantation; half the present labor of the rubber collector consists in his long tramps through the swampy forest.—*Dominica Dial.*

Swiss Labor Statistics.

The most recent report of the Department of the Interior states that there are in Switzerland 8,642 factories and workshops under legal supervision, 1,472 of which are worked by machine power. Of these, water furnishes the movement to the amount of 41,316 horse power, steam to the amount of 18,064, and gas to the amount of 117. The number of operatives employed is 134,862, of which 70,364 are males and 64,498 females. There are 10,462 children between 14 and 16 years of age, 14,590 between 16 and 18, and 109 810 over the latter age. The textiles, such as cotton, silk, woolen, and linen, occupy 1,619 factories, with 85,705 work people; 68 establishments carry on tanning, leather dressing, hair weaving, etc., with 3,753 hands; there are 6,636 hands employed in 143 food preparing shops; 2,749 in 102 chemical works; 4,950 in 150 printing shops. There are also 111 wood working establishments, occupying 2,913 hands; 353 for clock and jewelry making, with 24,988 work people; and 96 for glass making, etc., with 3,170.

A Lure for Trout and Black Bass

Is suggested by one of the writers to a sporting periodical that is somewhat novel. He says that he has used it for thirty years, and never saw its equal as a bait. The skin of the neck and the head of a fowl, with speckled and red feathers, cut into narrow strips with the feathers on, makes a most enticing bait, and it may be used fresh, or be kept pickled in salt brine from fall till spring. He says:

"When on the hook it is a most enticing bait, and being tough hangs on well and looks bright. I have caught a basket of trout with one bait. Sometimes you may want a bait like a bug or grasshopper, or a large miller; this you can closely imitate by leaving on one or two feathers. Sometimes by cutting from the wattles near the bill, with a feather or two, or a piece of the comb and a piece of the little feathers attached, will lure a trout when nothing else will."

SPRING WHEEL FOR TRACTION ENGINES.

Difficulty has always been experienced in the use of traction engines, on ordinary roads, on account of the rigidity of the wheels and the injury to the machine by jolting, for lack of sufficient elasticity. The general idea of using elastic spokes in wheels is an old one. But the particular form here shown seems to be especially adapted to traction engines, and has proved highly successful in practical operation in England, where traction engines furnished with these wheels have been run for between two and three thousand miles with great satisfaction.

Engines of this construction were shown by J. & H. McLaren, of Leeds, at the recent agricultural show at York. The rim of the wheel is made of strong iron rings and steel cross plates. The wheel hub has wrought iron ribs to which the spring spokes are bolted. The springs are made of the best steel, nine inches wide by half an inch thick. When the weight of the engine comes on these spokes, those nearest

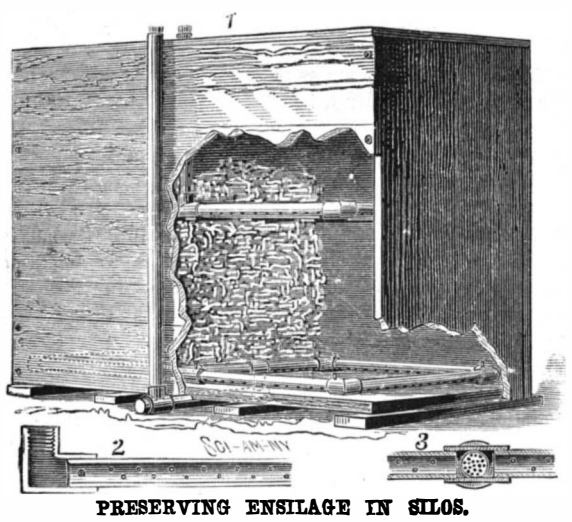
SPRING WHEEL FOR TRACTION ENGINES.

the ground are compressed a little and those at the top elongated. The driving strain is sustained by an arm attached to the rim.

METHOD OF PRESERVING ENSILAGE IN SILOS.

To preserve corn or other vegetable matter in silos it is necessary for its preservation to remove all air before heating or fermentation sets up. This has been done in a very imperfect manner by placing heavy weights on boards covering the top of the ensilage, the air escaping through cracks between and around the boards; but as silos are from twelve to twenty feet deep, a large percentage of air will remain in contact with the ensilage, especially in the central and lower portions, when treated in the ordinary way. The heavy pressure commonly used has a double disadvantage, inasmuch as the walls of the silo must be made very strong, to resist lateral pressure, and ensilage under pressure ferments much more rapidly than it would were the pressure slight, as the juices of the ensilage are expressed, and finding their way to the bottom of the silo are readily attacked by fermentation.

The improvement shown in our engraving has been patented by Mr. Samuel M. Colcord, of Dover, Mass., and is



PRESERVING ENSILAGE IN SILOS.

designed to preserve the ensilage in a sweeter and more wholesome state than is possible by the ordinary method. This improved device not only removes atmospheric air from the silo very speedily and perfectly, and with much less than the usual pressure, but it permits of a ready examination of the contents of the silo, and affords a means of applying chemical preservatives for preventing or arresting fermentation.

By reference to the engraving it will be seen that the silo is provided with a frame of perforated metal pipes at the bottom, connecting with one or more pipes leading out of the silo and upward to the surface. Juice or water accumulating at the bottom of the silo may be removed through the horizontal pipe, and the condition of the ensilage at the bottom of the silo may be determined by the odor rising from the vertical pipes, or by dropping a sensitive thermometer into either of the pipes. Figs. 2 and 3 show the pipes in detail

A second set of pipes is supported upon a skeleton frame half way up the silo. The number of these sets of pipes may be increased, and of course the number of pipes in each set may be varied.

The pipes and the skeleton frame supporting them may be readily removed when reached in the operation of discharging the silo.

This apparatus may be readily applied to silos of the old style already in existence.

This useful invention will be readily understood without further explanation, and further particulars may be obtained by addressing the inventor as above.

A Study of Leprosy.

Dr. G. H. Fox, the lecturer on cutaneous diseases at the College of Physicians and Surgeons, New York city, has recently made a trip to a leprosy lazaretto at Tracadie, Province of New Brunswick. In an interview with a representative of the New York *Sun*, Dr. Fox gave some interesting information about this disease, which is less understood than its terrible character seems to demand. Dr. Fox says that leprosy is not absolutely and always incurable, and suggests that a wealthy man who would endow a bed in the Skin and Cancer Hospital, so that lepers would come there, would be greatly facilitating the study of this disease. Nearly all the patients at Tracadie are descendants of two sisters, who, about 100 years ago, are said to have contracted the disease by washing clothes for sailors. In the beginning of the century there were about 100 cases in the neighborhood of Tracadie. A hospital was built on Sheldrake Island, not far from Tracadie, especially for lepers. Dr. Fox found a woman 80 years old in the lazaretto, who came there as a leper when a child. She was discharged as cured thirty years ago, but subsequently returned with fresh symptoms of the disease; but, in the doctor's opinion, she will die of old age rather than of leprosy.

Many of the patients have the worst form of leprosy—tubercular leprosy or leontiasis—so called because large bunches often form over the eyes, giving the patient a lion-like, brutal expression. It is frightful to be in a room surrounded by such lepers. The macular lepers merely have bronze patches over the body. The disease is hereditary, but not contagious, except by inoculation. To illustrate this phase of the disease the doctor said:

"A priest who visited the lazaretto caught the disease; but I heard from Babineau that this priest, in a spirit of bravado, would take a pipe from a leper's mouth and smoke it. So he caught the disease from inoculation."

Dr. Fox does not think that the disease is infectious. If he is correct, the story of the origin of it in Tracadie must be rejected, and the infection of the women by washing the clothing of diseased sailors be treated as a myth. But the most important portion of the doctor's revelations must be that he knows of "six cases of leprosy in this city," and believes that "cases of leprosy exist in the Chinese quarter of New York, housed with other people and perhaps intermarrying."

Extreme Minuteness.

When vision is not aided by any magnifying process, there is a point of minuteness, as all know, when an object will make no impression upon the retina, and will not be seen by the unaided eye. But when the object is viewed by means of a microscope, it becomes visible. There is a question, however, that remains unanswered, which is, whether any object may become so attenuated that it cannot be made visible by any means. Not many years ago, less probably than twenty-five, there were lines that could not be resolved by any microscopic lenses then in existence, which can be exhibited now without any difficulty; but, at that time, makers of lenses had not attained to the skill of making them with large angles of aperture, but now they are made with the highest angle that is possible, and consequently the capacity of such objectives can only be increased by greater skill in their manufacture. But the limit of angle of aperture having been reached—no opportunity remaining of increasing capacity in that direction—is it not reasonable to suppose that, with present appliances, no greater skill in manufacture can be expected? Sir Royston Pigott, recently, at a meeting of the R. M. S., stated that he had seen globules of mercury, made by smashing a minute particle of mercury with a watch spring, less than $\frac{1}{100}$ of $\frac{1}{10000}$ of an inch, or less than the millionth of an inch. Another member replied that he was not aware that there is any limit of visibility in the microscope other than that imposed by the sensibility of the observer's retina, the correction of the objective, and the illumination.—*The Microscope.*

Coated Tongues.

Among the various substances which have been found on the human tongue, as shown by the microscope, are the following: Fibers of wool, linen, and cotton; fibers of spiral vessels; fibers of muscle, in one case eight hours after eating; starch grains; cheese mould; portions of potato skin; scales, moths, etc.; hairs from legs of bees; hairs from legs of spiders; pollen of various flowers; stamens of various flowers; hairs of cats, quite common; hairs of mouse once only; hairs from various leaves; wing of mosquito once; fragments of the leaves of tobacco, of chamomile flowers, etc.

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Analysis of Feldspar.

On comparing the results of the analysis of feldspar by Vauquelin and Chenevix, both of them chemists of acknowledged ability and scrupulous accuracy, it is impossible not to be struck with surprise at the remarkable difference that appears between them. That potash should appear in one analysis and not in the other is no extraordinary circumstance, because without a particular examination for this very object the potash would remain undetected and its amount would be transferred to the general account of loss; the loss, therefore, in Mr. Chenevix's analysis ought to be equal both to the loss and potash in Vauquelin's; but the amount set down as loss in both cases is nearly equal, therefore the difference between the earthy and metallic products of the two analyses amounts to 13 per cent, being the proportion of potash as ascertained by Vauquelin. In order to obtain some clew to account for the difference, the methods of analysis pursued by these chemists have been compared and examined, but without obtaining much satisfaction.

Mr. Chenevix, after finely pulverizing his feldspar, treated it with caustic potash in a silver crucible, and the whole was then brought to a limpid solution by muriatic acid. 1. The liquor was evaporated to dryness, and the saline residue digested in a slight excess of muriatic acid; a white powder remained insoluble, which was silex. 2. The muriatic liquor with the washings of the silex was then mixed with ammonia, and a copious precipitate was obtained. 3. This precipitate was then dissolved in muriatic acid, and afterward boiled with an excess of potash, by which the iron was deposited; and the addition of muriate of ammonia then threw down the alumina. 4. The ammoniacal liquor No. 2 was treated with carbonate of potash, by which carbonate of lime was procured. This method of analysis appears quite unexceptionable as far as the earthy and metallic contents are concerned, and, if carefully performed, there appears no reason why its results should not be considered as giving the true proportions and quantities of the earths and oxides of iron contained in feldspar, proper allowance being first made for the inevitable errors to which the most accurate analysis is necessarily subject.

The method employed by Vauquelin was the following: Having fused the feldspar with caustic potash, he dissolved the mass in dilute muriatic acid, and evaporated the whole to dryness. 1. The saline residue being drenched with water and filtered, the silex remained behind as a white insoluble powder. 2. The clear liquor being treated with ammonia, produced a copious white precipitate. 3. This precipitate was digested in caustic potash and left behind the iron; muriatic acid was then added to saturation, and afterward carbonate of potash threw down the alumina. 4. The liquor No. 2 gave no precipitate with carbonated potash or sulphuric acid, but oxalic acid occasioned a precipitate of oxalate of lime, which, when calcined, was considered as carbonate of lime, whence the amount of lime was estimated according to the usual proportions. The only exceptionable part of this analysis relates to the method of procuring the lime, and this on two accounts. In the first place, oxalic acid would not separate the whole of the lime from the liquor, which consisted of the muriates of lime, potash, and ammonia; and in the second place, the oxalate of lime which was precipitated ought by no means, after having undergone calcination, to be considered as carbonate of lime, but as lime in a semi-caustic state. It is further a singular circumstance, and contrary to general experience, that carbonate of potash should have been unable to throw down the lime from the solution which was decomposable by oxalic acid. But even if we allow the utmost possible weight to these objections, and in consequence raise the amount of lime in Vauquelin's analysis to an equality with that of Chenevix's, there still remains a difference of 11 per cent unaccounted for. That potash is really contained in the Siberian feldspar appears also from a subsequent analysis by Vauquelin, in which he used caustic soda as the primary solvent, and afterward obtained crystals of alum by the addition of sulphuric acid. It is, however, worthy of notice that the account of Vauquelin's experiments is not written by this eminent chemist himself, but is contained in a paper read at the *Societe Philomathique* by Le Lievre, and in consequence is not in the most authentic form.

With regard to the opposite analyses of adularia by the above mentioned chemists, it is difficult to form any satisfactory opinion, as the details of Vauquelin's analysis are not published. It may, however, be remarked that in the amount of silex they actually correspond, and that the proportion of alumina as determined by Vauquelin approaches much nearer to the statement of Chenevix than in the former instance. The chief difference is the proportion of lime, but if, as is probable, the same method was used by Vauquelin on this occasion as was practiced by him on the former one it may be suspected that Chenevix's estimate approached nearer to the truth. The water of crystallization, amounting to 1·75 according to Chenevix, is wholly neglected by Vauquelin; and it is obvious that the proportion of potash as given by this chemist is from mere estimation, and is reckoned at 14, because just so much was wanted to complete the original 100 parts that he operated on. The iron obtained by Chenevix is perhaps only a casual ingredient of adularia, so that making the requisite allowances for each analysis, the quantity of potash can hardly be estimated at more than 6 per cent. It is greatly to be regretted that Klaproth or Hatchett did not undertake anew the full analysis of this important mineral in all its varieties and subspecies.

Some further interesting particulars respecting feldspar are contained in a memoir by M. Gerhard. Common feldspar when heated to incandescence loses 1 per cent (probably water). After being calcined it is readily acted on by sulphuric acid, and the product is a little selenite and much alum, the silex remaining unaltered by the acid. From an analysis conducted in this manner M. Gerhard states the constituent parts of feldspar at, silex 64, lime 6, alumina 30, total 100.

Here it is worthy of remark that the presence of potash in this mineral is fully ascertained by the copious production of alum when it is treated after calcination with sulphuric acid, and this is the less liable to suspicion as the memoir was published long before the necessity of potash to the crystallization of alum was suspected. Consequently we find in M. Gerhard's analysis no mention of potash, and perhaps it is somewhat in favor of the reduction which we have made in the proportion of alkali as given by Vauquelin, that this reduced proportion, namely, 6 per cent, added to the quantity of alumina found in common feldspar by Chenevix, namely, 24 per cent, exactly corresponds with the amount of alumina as stated by Gerhard. In the proportion of silex he also agrees precisely with Chenevix, and in the quantity of lime differs only in the ratio of 6·25 to 6.

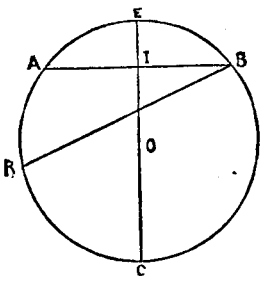
Common feldspar inclosed in a crucible and exposed to a full melting heat, is converted to a milk white semi-transparent mass resembling quartz. The addition of silex diminishes its fusibility and renders the mass more opaque. Four parts of feldspar and one of chalk form a clear, transparent glass of a slight yellowish green color; but a much more beautiful glass may be obtained by calcining separately one part of sand, four of feldspar, and two of chalk, and then fusing them together; this glass is however harder and more difficult to anneal than common glass, and the metallic oxides only communicate to it dull, muddy tinges of red and brown, except cobalt, which gives it a purer blue than common glass is capable of acquiring.—*Glassware Reporter.*

FROM PARIS TO RIO JANEIRO IN 42 MINUTES AND 11 SECONDS.

Mr. E. Colligan, in a paper read before the French Association for the Advancement of Science, discusses the possibility, were the thing practicable, of reaching any point whatever of the earth's surface in 42 minutes and 11 seconds. This would be effected by means of a perfectly straight tunnel connecting the two termini of the line.

Supposing such a tunnel to have been excavated, "lay the rails," says the author, "do away with the locomotive, lubricate the journals, and let go. That is all! Whatever be the points of the globe that you join in this way by a tunnel, you will go from one end of the line to the other in 42 minutes and 11 seconds.

"Should such a tunnel traverse the sphere from one side to the other, in passing through its center, things would occur just the same.



"Excavate such a tunnel to as great a length as it would be possible to make it in a straight line; throw yourself with confidence into this tube, and you will arrive, without shock, and with the slowness with which you departed, at the south of New Zealand, if the mouth were at Paris, and always in 42 minutes and 11 seconds.

"It would be well to throw yourself in head foremost, so as not to reach the terminal station feet upward. It would be well, too, to have a friend there to hold you. . . .

"These facts, which are absolutely true, are based upon theories analogous to those that rule the oscillations of the pendulum. We know, in fact, that if a mass attracted to the extremity of a thread is oscillating in space, the duration of such oscillations will be the same, whatever be their extent, if the arcs do not exceed a few degrees.

"Clockmakers have reaped great advantage from this principle, and it is due to it that a clock remains none the less well regulated although the pendulum in motion varies from double to simple.

"Were it possible to attach a pendulum at such a height that an arc described between Paris and Versailles, or Paris and Saint Cloud, did not perceptibly differ from a cycloid in form, these two distances would be traversed in the same time, and, an impulse once given, it would only be necessary to keep up this immense tic-tac in its extent.

"But let us draw a figure like the one annexed, where the circle, A B C, represents the circumference of the earth; B, Paris; A, Rio Janeiro; and A B, a tunnel joining them.

"If a train be left to itself at B, it will descend slowly toward I, but will soon acquire a velocity that will reach its maximum at the latter point. This velocity, of which the sum of 42 minutes will give some idea, changes gradually and returns to zero when the train touches the extremity of the tunnel at A.

"The only question now is that of locking the wheels on arrival, in order to prevent the whole from making a second descent before landing the passengers. If the train were left to itself without such a precaution, it would go on in definitely from A to B, and from B to A, and always in 42 minutes and 11 seconds.

"From B to R, as well as from E to C, things would occur just the same."

But the reader may raise objections. There are many, it is true, and one especially that outweighs all others, and that is, that if such a supposed tunnel were excavated, the traveler once under way would have to undergo pressures whose immensity may be seen from the following figures:

"Thus, supposing that the point, I, were situated at the fifth part of the terrestrial radius, E O, the pressure there would be 34,547 atmospheres multiplied by 10 raised to the 58th power. It would take 63 figures to represent such a quantity.

"Were E I one and I O four, we should have, for pressure at I, 168,600 atmospheres multiplied by 10 raised to the 71st power—an amount composed of 78 figures. Were I at the center of the earth's radius, the pressure would be 194,240 atmospheres multiplied by 10 raised to the 175th power (132 figures); and, finally, at the center of the earth, the pressure would become 320,000 multiplied by 10 raised to the 169th power, or 175 figures. This is formidable!

"If we reduced the question to a pressure of three atmospheres, the greatest that man can support, we should scarcely be able to go further than from Marseilles to Calais by such a method, making, be it understood, no account of the resistance of the air, which, moreover, would prove an obstacle to a realization of such a project.

"But why excavate a tunnel? asks an enthusiast. Tangent to the surface of the globe let a bridge be built, whose termini shall be at the same altitude, and we shall no longer have to support so enormous pressures. It would take longer to make the trip, that is all. We might go thus from the Canigou to the Yungfrau, which are at the same altitude.

"Such an improvement, we answer, might cause a rise in the stock, but it would also raise the traveler to disagreeable altitudes, and the stations would not be within reach of everybody."—*La Nature.*

Mutuality Between Employer and Employe.

An article recently published editorially in the New York *Times* suggests one of the ready, or at least feasible, means of uniting the workman and his employer, and suggests also the fact that the more and the closer these ties, the less need there will be of autocratic trades unions and similar defensive combinations. The article refers to an association among the employes of the Baltimore and Ohio Railroad Company, which is "a mutual insurance association, to whose fund the company itself made a substantial contribution, and which is kept up by a monthly payment by each member proportioned to the salary or wages he is receiving. The benefit to be received holds a corresponding proportion to the payments. Out of this fund each member receives a stipulated sum per day during any sickness or disability while in the service of the company, and in case of death his family receives a substantial benefit. It is an absolutely safe form of mutual insurance against sickness, injury, or death, and one in which there is no expense for management. To this plan the Baltimore and Ohio Company has added the feature of a savings fund, on which 4 per cent interest is paid to depositors, and from which they may borrow for building purposes at 6 per cent."

Except the savings fund department, the Pratt & Whitney Company, of Hartford, Conn., has had in operation, for ten years, a similar mutual benefit association, and the officers and board of directors are chosen both from the "office" and the "shop." Mr. F. A. Pratt, the President of the Pratt & Whitney Company, says, in relation to the *Times* article: "I think the savings fund feature a good one. I would also add a reading room and library, in which the men could assemble evenings, read, talk, and hear a lecture occasionally. My ambition is to have all this, and we have drawings of an office building, that may be built before a great while, that will embrace such improvements. I believe that in our class of work it will not only be a help to us, but has almost become an absolute necessity."

Subaqueous Troubles in Lake Michigan.

In Grand Traverse Bay recently, at some distance out in deep water, between Traverse City and Marion Island, the water began to boil and surge, and presently rose in vast jets to the height of from 10 to 20 feet. Being observed from the shore no details could be given on account of the distance; but the same thing has taken place years before, and some two years ago, according to an account given by the *Herald* at that time, parties in a boat were so nearly on the spot that they were obliged to hasten out of the way. They described the water as apparently boiling up from the very bottom of the bay, which in that place was nearly or quite one hundred feet deep, bringing up with it vast quantities of mud and other substances and emitting an intensely unpleasant sulphurous smell. The area of the eruption, if it may be so called, was about twenty feet in diameter and the time about half an hour. At intervals the water would subside into calmness and then the commotion would begin again. It is said by old settlers that the same thing has occurred in other years.—*Grand Traverse Herald.*

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Correspondence.

An Invention Wanted.

To the Editor of the Scientific American:

May I venture to suggest that among your hints to inventors you suggest a portable paper commode for travelers and for the sick room, that can be carried folded before using; and that can be rolled tightly at the open end after using and instantly thrown away. The writer's experience in a sick room shows that even a paper bag so used prevents dissemination of noxious odors; but it should be somewhat waterproof, and capable of tight sealing. Such a thing would lessen the troubles arising from closets, and enable the waste to be more readily removed for manuring. Any one of our closet paper manufactories could realize handsomely from such an article. The annoyance to ladies, who among strangers or elsewhere are obliged to seek a closet rather than a private room merely, would be removed.

X. Y. Z.

Portland, Me., August 10, 1883.

Poison Ivy.

To the Editor of the Scientific American:

Having lived more than fifty summers in well founded dread of any chance contact with the three leaved pest, *Rhus toxicodendron* (or *Rhus radicans*—which is it?), I deem it a duty to publish the only effectual remedy, of the many I have seen recommended and have tried in the course of my extended sufferings—now for some years happily ended. Four or five years ago, I was led to try *Bryonia alba*. The tincture did no good. The next season that I caught the poison, I tried Bryonia in the third (homœopathic) attenuation, as an antidote, in alternation with sulphur (same attenuation), to relieve the itching and burning; taking one in the morning and the other at night. The result was immediately satisfactory in both respects. The attack passed off gradually, with little eruption or distress. Next season, for a test, I fortified myself with a prophylactic dose of Bryonia, and marched boldly on my business through and through a field overgrown with the malignant weed, adding a second dose at night. For the first time in my life I looked on poison ivy with impunity, and even trampled on it. This summer, grown careless with security, I have several times blundered into a bed of the stuff, without taking either prophylactic or remedy. The poison asserted itself feebly, with moments of the unmistakable burning itch characteristic of it, on parts of the skin which it frequents most, but this only when provoked by friction, and presently passing off, with no eruption. It seems evident that the antidote I have used has not only overcome the poison, but the susceptibility to its influence, which is well known to be relative and constitutional, many persons being naturally quite exempt.

WM. C. CONANT.

Montclair, N. J., August 11, 1883.

Patent Experts.

To the Editor of the Scientific American:

On page 64, current volume of the SCIENTIFIC AMERICAN, under the headline, "The Relation of Patent Experts to the Courts," you give at length the pros and cons in regard to this important class of witnesses, "admitted to possess a peculiarly full knowledge of the scientific points involved in the issue." If it were *true* that the professional expert possessed a fair knowledge (even), rather than that he can glibly profess to have such, there might be less of outrageous assumption and decision in patent cases.

How such one sided superficial testimony can have so much influence with an intelligent court is beyond the common comprehension. A case in point, decided a few years ago, was in which a professional expert, "a civil and mechanical engineer" professed to be "posted" in "the whies and wherefores" of all things, especially, just then, of turbine wheels and the intricacies of their construction, having "studied considerably on the action of" the same, "and how the water acts upon them, having read various books on the subject, commencing with the first turbine nearly thirty years ago."

When cross interrogated as to what "books" he had "studied," the answer was, "Several, but I cannot now tell the name of any one of them." "Did you ever design or assist in designing, make or assist in making, ever test or ever operate any turbine wheel?" Answer, "I never have."

"Did you ever see in operation . . . a water wheel made in accordance with G.'s patent?" "I never have." Or "like complainant's, or like defendant's, or so-called W.'s wheel?" "May have seen them; . . . have seen turbines; . . . have never examined one closely while in operation." "Ever see in operation T.'s patent wheel?" "Cannot tell." "Have you any recollection . . . such wheel?" "Have not, may have seen it without knowing what wheel it was." And yet lengthy arguments were based upon his knowledge of these wheels, and comparisons of principles and merits instituted, largely, of course, almost entirely, probably, on the verbal instructions of his employers.

Opposed to him were three practical and experimental experts, and who had made the subject a special study for years. Their practical experience was of no more account, however, than so much wind. This make believe walking cyclopedia assumed, in the interest of his employers, to deny and to ignore not only the arguments of his opponents, but the facts, the truth of proportions, forms, and designs as materialized in the patented model before the eyes of all who chose to see.

The more outrageous part was that the presiding judge, at the final hearing, expressed in his decision in the case, the same contempt for facts and figures given on the other side. Not only that, but important statements were made, in italics, as historical facts, in which there was not a shadow of truth.

It is not charged that this mistake was intentional, but a compound of ignorance and assumption.

It is perhaps well to employ experts by and in the interest of each party to a case. It seems to the writer that it would be far better also to have a disinterested intelligent man to give his whole attention to particular branches, as hydraulics for instance, to report the facts to the court, something as a master in chancery in case of an injunction and order for an account. If the man knew his business and attended to it, all such assumptions and hyperbolic statements would be toned down, or ordered out.

H. DYNAMICUS.

Drawer Making.

Most articles of furniture being fitted with drawers, the method of making, fitting, etc., forms a very important branch of cabinet making. I shall, before describing the manner adopted, make a few remarks respecting the work into which they are fitted, and other essential particulars. Drawers are most frequently placed one above the other in carcasses, being supported and separated in front by partitions. These partitions play a very important part in the structure, and one to which sufficient attention is not usually given. I shall, for the sake of illustration, assume that we are making a cabinet about 20 inches or so wide. I need not enter into details, but will suppose that it is to be constructed with two or three drawers, placed over each other in front. The ends, having been planed over, both inside and out, should be squared up. For this purpose they must be fixed together. This is done by means of a small handscrew at the edges, or by nailing them in four places near each corner. All work intended to receive drawers should be squared up a little out of the square. It should be a trifle wider at the back than the front, and also a little higher. A very small amount will do; it must not, of course, show to any perceptible extent—about one-eighth inch is quite sufficient.

The tops and bottoms for your carcass should be of three-fourths inch pine; in larger work you may with advantage increase this thickness. You should get them out 1¾ inches longer than the inside measure your work is to be. This will allow three-fourths inch nearly each side for dovetailing into the ends. This thickness of wood will work about five-eighths inch, and you should have your partitions finish the same, to keep all the front in unison. The position of the drawers is now set out on the inside front edge of one end, and the other marked from this. You must first mark the top and bottom thickness, and then divide remaining space for your drawers, carefully marking the top and bottom of each partition edge. From these markings the ends are squared across, and grooved to a depth of one-fourth inch with an iron to correspond with the thickness of the edges. The partition edges should be of sound, seasoned pine, three-fourths inch thick and 2½ inches wide.

In larger work it is advisable to use a little thicker and wider stuff. They must be got out 2 inches longer than your drawer fronts are to finish. Their front edges are slipped or faced with similar wood to what you are making the cabinet of, the slips and edges being toothed before gluing together. The back edges are plowed about one-half inch deep, with a three-sixteenths inch iron. The tops and bottoms having been dovetailed together, these partition edges should be tightly dovetailed in from the front edges and cramped up. The dovetails should be three quarters the thickness of the ends long. In some cases, where the drawers stand back in work, it is impossible to put in the edges in this manner. They should then be tenoned in and cramped. You will require some runners; they should be of pine. Get them out the length the drawers are to be, and an inch, or rather more, wide. They are plowed on one edge with the same iron as used for the partition edges, and about the same depth. Take them to the requisite thickness—that of the carcass end grooves. Be very particular with this; they must fit well. The best way is to get a piece of wood and groove it similar to your ends.

Now, after taking the runners to a thickness, just try whether they will all draw tightly through it. You will be able to see where a shaving or two is wanted off. You must tenon them into the back edge of the partition rail. Now glue the mortise, knock them into the rail and into the carcass grooves. It is unnecessary to glue them; but it is better to put a screw through the runners at the back into the ends. The next thing is to get out some partitions. They should be of very dry, seasoned wood; pine will do very well. Their thickness should be about that of nine-cut stuff; the length a little more than that between the runners, allowing for the plow grooves each side, and a little additional, say one eighth inch, for working. For most purposes the width of a board, 11 inches, is sufficient; but if the carcass is very wide, it should be greater. These partitions are smoothed over, and the front and one edge squared, then chamfered, until they will fit the grooves in partition edges and runners pretty tightly. Now put the chamfered side in the runner. Remember, the direction of the grain of the partition should be across, the same as in the partition edge in front; mark its length, square this across, and chamfer it the same as before. Then remove any glue that may be in the grooves of the partition edges and runners, where the tenons are, with a narrow chisel, run your partition in, and drive them home into the edges with one or two blows with a mallet.

Sometimes drawers are placed side by side, as in the top frame of a library table which usually contains three, or the front of a dressing table with two. In both cases the method of construction is very similar. The top and bottom rails forming the partition edges will be in the library table, or anything similar, dovetailed into the ends from the top and bottom respectively. In the dressing table, which would be supported on legs, the top rail only would be dovetailed in, the bottom one being tenoned into the legs. The width of all these rails may be from 3 inches to 4 inches, and their thickness, assuming the jobs are made about 4 feet wide, should be seven-eighths inch finished. The other partitions separating the two or three drawers, the dividing partitions, will be tenoned into the top and bottom rails. They should be got out long enough for the tenons to come right through, the projecting ends being afterward cut off. Underneath and above each dividing partition a cross rail or rails should be tenoned into the front rails and dovetailed into the top and bottom of the back frame.

It is necessary to get out some pieces to act as guides, and glue them on the bottom cross rails up to the dividing partitions in front. They need not be very wide—three-fourths inch or one inch will do; their length that of the drawer sides, and their thickness the same as the dividing partitions. You should work them underneath, then glue, and set them square with the dividing partitions. This is best done by running a square along the front rails, and putting the guiders up to its edge. In a dressing or toilet table there will be a space at each side, because the end framing will be mortised and tenoned into the legs. This space, the difference between the framing and the square at the top of the legs, must be filled up level. This will be all that is requisite; it is not necessary to use runners with partitions fitting into them, as in carcass work; because the difficulty we have to counteract there, that of the tendency of the ends to cast, does not here exist. Partitions may be used in a dressing table; they are useful for preventing the drawers getting so dirty; but they merely act as dust boards, and are not essential to the structure.

Drawers have occasionally to be fitted into work where they are placed at the back of it, and draw forward over another portion of it, like those in small cabinets, writing tables, and secretaries. They are in these cases usually much smaller than in those previously described. When in this position they should never be allowed to be level with that portion of the work they draw over. They must work on a bottom. This should be one-eighth inch, or rather more, thick and one-fourth inch wider than the drawers from back to front. It is fitted in and the ends mitered; now fit same thickness in at each end, and in the middle or wherever the drawer divisions are to be. All these should be about 2 inches wide, and put in in the same manner. To these partition girders are fitted as before described.

The foregoing examples include most cases in which drawers are met with, although they are sometimes, either for want of space or because the work is of a miniature description, fitted in carcasses without partition edges. They often work on tongues. There is nothing special in the construction in this case. The ends should be set out and plowed for the tongues about three-eighths inch deep. These grooves should be well glass-papered before putting together.

In selecting wood for drawer making, care should be taken to select that which from its nature is most suitable. What is required is a straight, firm, durable wood, one whose surface will offer or present the least friction when in use. This is especially necessary for the sides. The best woods are oak, teak, and mahogany for large and medium-sized work; for smaller work sycamore and boxwood may be used. You will readily observe the different appearance and nature of either of these compared with a softer wood like pine, or one of a sticky or gummy nature like cedar.—*Building News.*

Fires from Cotton Pickers.

A correspondent from Pennsylvania, alluding to the article in the SCIENTIFIC AMERICAN of August 4, on "Picker Room Fires," says that probably matches accidentally bagged with cotton cause more fires on shipboard and in picker rooms than any other causes. "Smoking is very general," he says, "at the South, and among mill (packing) hands. Smokers carry matches, and matches are liable to drop and be swept up into the cotton. An old picker tender can tell of picking matches off his feed, especially when working waste and sampled cotton."

Death from a Carbuncle.

Dr. Frank L. Rea, assistant demonstrator of anatomy in the College of Physicians and Sugeons in Chicago, died, August 3, of malignant facial carbuncle. His death has attracted a great deal of attention from medical men in the city. On Tuesday, July 31, says the *Evening Post* of New York, he applied to a druggist to pull a hair from his moustache. The hair was pulled and examined by Dr. Rea, who said that the condition of the hair root showed the beginning of a carbuncle. Dr. Rea died in five days.

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NEW COMBINATION LOCK.

This is a combination lock in which a series of disks are substituted for the bolt, the disks being mounted on a knob spindle, to be turned by it to lock and unlock, the locking being effected by shifting the disks, so that any portion of of the disks will project through the lock case, and the unlocking by shifting them to a position in which the line of a segment cut off will coincide with the plane of the lock case. One of the series of disks is positively connected to the spindle and turns with it, and, after making nearly a whole revolution, communicates motion to the next. The rest are operated successively in like manner, so that in the operation of unlocking the knob is shifted alternately to right and left a certain number of turns or parts of turns for each disk known to the operator.

As shown in Fig. 3, the disks are alike in size, thickness, and material, and all have a similar segment cut away on one edge, and the first disk is connected to the knob spindle positively by means of the notches in the eye of the disk and the teeth on the knob spindle.

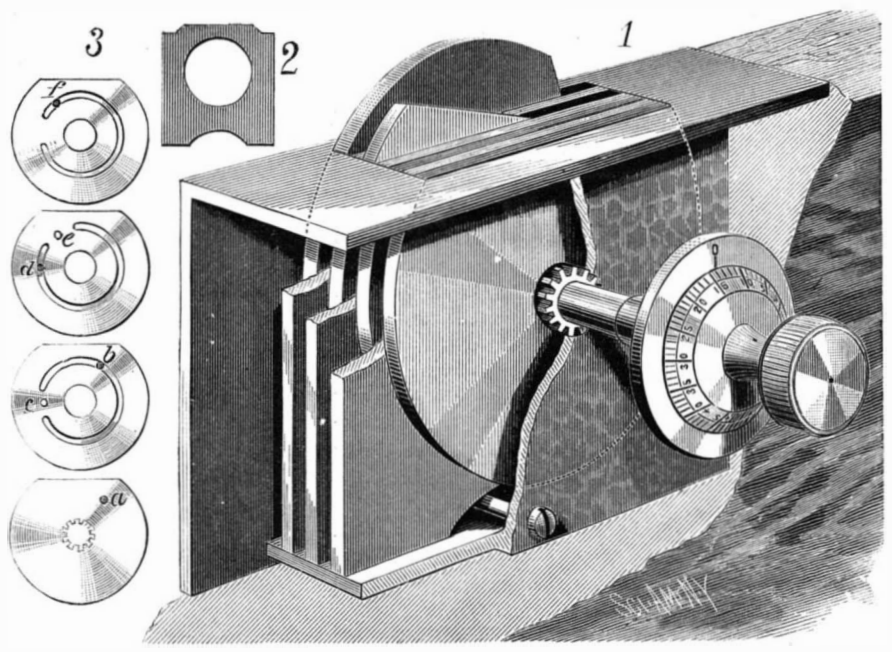
This disk has a stud pin, *a*, which projects through a central hole in the partition plate (Fig. 2) placed between this disk and the next, and into the curved slot, *b*, in the latter, which extends nearly but not quite around the circle. The second disk has a pin, *c*, extending into a curved slot, *d*, in the third disk, and the latter has a pin, *e*, extending into a similar slot, *f*, in the fourth disk. This latter, being the terminal disk of the series, has no pin.

To unlock the lock the spindle must be turned four times to the right and stopped at the number on the indicator known to coincide with the zero mark when the disk coincides with the face plate of the lock. This simple arrangement of tumblers renders it impossible for one not knowing the combination to open the lock.

The combination is capable of being readily changed so as to render the lock as good as new should the combination become known to unauthorized persons.

The simple construction of this lock admits of cheap manufacture, and at the same time insures great durability.

This invention has been patented by Mr. James W. Allen, 102½ North Fifth Street, St. Louis, Mo.



ALLEN'S COMBINATION LOCK.

The Orfe.

The fine specimens of the orfe presented by the Duke of Bedford to the International Fisheries Exhibition, and exhibited in one of the tanks of the Aquarium, fully deserves, says *Nature*, the notice of all interested in the culture of our fresh water fishes. They are some of a number which Lord Arthur Russell succeeded in importing from Wiesbaden in March, 1874, and which were placed in a pond at Woburn Abbey in Bedfordshire. Owing to the succession of cold summers these orfes did not breed until last year, and we may hope that this season will also prove favorable. This species may now be considered as acclimated, and will become a permanent acquisition to our ornamental waters.

The orfe, whose bright yellow or golden colors resemble those of the goldfish or golden tench, is, like these two latter fish, a permanent variety of a wild and much less brightly colored race, belonging to the same genus as, but specifically distinct from, the chub, with which it was confounded by some writers. Its systematic name is *Leuciscus idus;* of vernacular names those of "Aland" and "Nerfling" are those most generally used in Germany, while the Swedes know it by the name of "Id." The name "orfe" refers to the golden colored variety only, which has been cultivated for centuries in inclosed waters in Bavaria. Willughby knew it well; he says in his "Historia Piscium" (Oxon, fol., 1686), p. 253: "At Augsburg we saw a most beautiful fish, which they call the 'Root oerve,' from its vermilion color, like that of a pippin apple, with which the whole body is covered, except the lower side, which is white."

As in the golden tench, individuals of pure golden-yellow tints are scarce, the majority retaining marks of their origin from a plain colored ancestry in brownish spots or blotches on some part of their body. The ordinary size of this species is ten or twelve inches (and this is about the size of those at the Exhibition); but it is known to have attained to double that size and to a weight of six pounds.

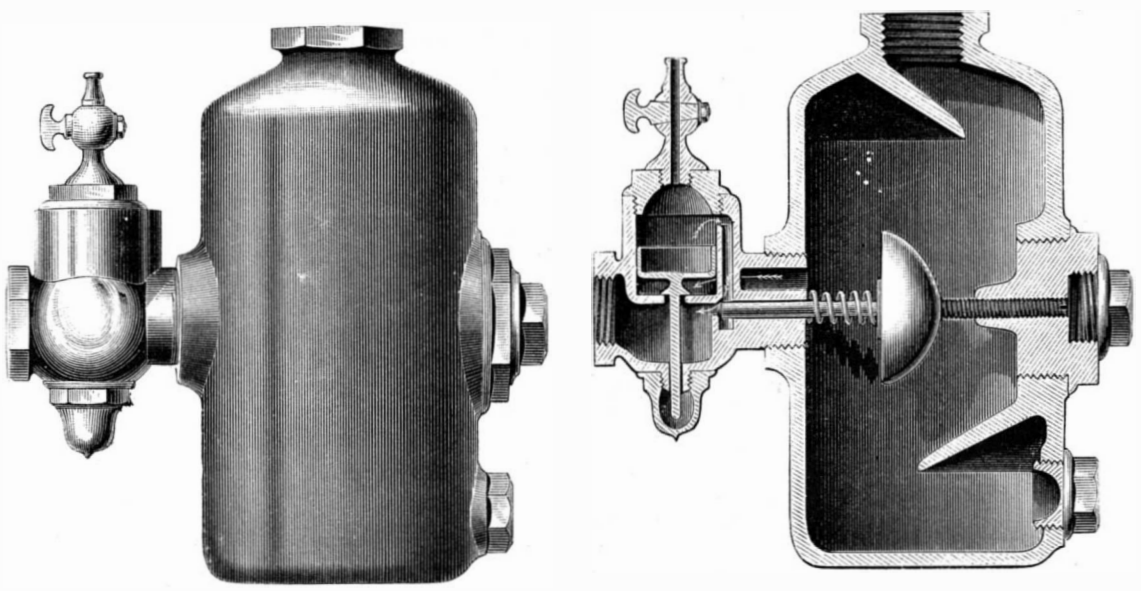
The orfe will thrive in all inclosed waters suitable to roach and goldfish; as an ornamental fish it is preferable to the latter on account of its larger size, livelier habits, and rapid reproduction; it takes the bait, and is eaten in Bavaria. As an ornamental domestic fish the goldfish will always hold its own, but for waters of any extent and free from pike and perch we know of no more ornamental fish than the orfe, a worthy rival of the golden tench.

Fish as Food.

Sir Henry Thompson recently delivered a lecture on "Fish as Food." It was an able summary of the known facts about fish, but Sir Henry went too far in his denunciation of the notion that fish eating increases brain power as a "complete fallacy." It has long been perfectly well known to physiologists that the phosphorus theory must be discarded, but it is a fact beyond dispute that fish is a form of food which is easily digested, and proves specially nutritive to the bodies of brain workers. Sir Henry Thompson thinks that the only way it acts is by putting a man's body into proper relation with the work he has to do. This may be quite true, and doubtless is so, but the brain is an integral part of the body. Moreover, it comprehends a considerable number of the most important centers of the nervous system, whence the body as a whole derives its power. Therefore, in putting a man's body in proper relation with his work, fish may chiefly act by supplying his nervous system with specially available nutriment.—*Lancet.*

NEW EXPANSION TRAP.

We illustrate the Curtis expansion trap, in which, in very compact form and with simple and durable mechanism, the objections to former traps have been overcome. With this trap steam users can utilize the enormous amount of heat which is contained in water at a temperature above 212° as compared with steam (volume for volume), and which is lost when the water is discharged above 212°, as it is by the use of a float trap which must discharge it as soon as it becomes water, regardless of its temperature; while with the Curtis trap the water may be discharged at 210° or any less degree of temperature. The operation of this trap is as follows:



CURTIS EXPANSION TRAP.—EXTERNAL AND SECTIONAL VIEWS.

The sectional view shows a main valve, lifted by a very loose fitting piston; a passage connecting the top of the piston with the outlet; a very small valve controlling that passage (by means of an expansion vessel and a stiff spring); and a mud drum, which can be cleaned by taking off the lower cap.

The principle upon which it works is the change of pressure on the top of the piston, the pressure underneath remaining constant (being the same as the pressure in the trap).

The operation is as follows: The trap is cold, and the flexible surface of the expansion vessel is pushed back by the stiff spring, thus opening the small valve. The opening of this valve connects the top of the piston with the outlet (under the seat of the main valve), and, relieving the pressure on top of the piston, permits the pressure underneath to raise the outlet valve for a free discharge.

Steam being let on, all the air and water in the pipes flow out freely, until the temperature of the water reaches the point at which the trap is set to close. At this point the expansion in the vessel is sufficient to force the secondary valve toward its seat. This restrains the movement of water through the connecting passage, thereby increasing pressure on top of the piston; which pressure forces the outlet valve toward its seat, and diminishes the flow of the water, delivering it only at the temperature at which the trap is set to deliver. The cap at the back can be taken off while pressure is on, and the degree of temperature raised by turning back, with a screw driver, and lowered by turning forward. It is claimed that this trap will fully control the outlet valve on a change of temperature of 5°.

The following are some of the advantages of these traps, which will commend them to those who have had large experience in the use of traps: The outlet valve, having an exceptionally large area (nearly four times as large as other traps with same sized connections), rapidly delivers great quantities of water, if present in the trap. The outlet valve, being located outside the body of the trap, can be cleaned and put in order by removing a simple cap.

The trap closing only by temperature, it follows that the air in the connecting pipes will pass out as fast as steam will displace it, the valve closing only when steam reaches it. This trap has no glands or friction, and no joints to leak. Any trap will work equally well under high or low pressure.

It is small and perfectly supported on the connecting pipes, saving expense in location and transportation. It has a mud drum to catch sediment, and an opening to remove it, and is handsomely finished, so that it may be located anywhere in sight and be accessible.

This trap is manufactured by the Curtis Regulator Company, 59 Beverly Street, Boston, Mass., having general agencies at 109 Liberty St., New York; 86 and 88 Market St., Chicago; 925 Market St., Philadelphia; and corner Holliday and Saratoga Sts., Baltimore.

Gold Reactions.

If we pour into a small phial a few drops of a dilute solution of gold chloride, some drops of arsenic acid, two or three drops of ferric chloride and the same quantity of hydrochloric acid, and about 100 c. c. of water, and introduce a fragment of zinc, the liquid soon takes a purple color in the neighborhood of the zinc, and on shaking takes throughout a fine rose or purple color. The experiment thus conducted may last for half an hour, but it is completed in a few moments if we use some centigrammes of zinc powder and shake the phial. The rosé coloration is also immediate if we pour into the solution of the salt of gold, prepared in the same manner, some drops of the liquid obtained by attacking metallic iron with dilute hydrochloric acid, or, better, by heating with a mixture of hydrochloric acid and arsenic acid. It is diluted with water, and left in contact with an excess of metal. This reaction is extremely sensitive. If one-millionth part of gold is present the change of color is very visible, and it may be distinguished even with a proportion of gold one-half less. The author purposes showing at an early opportunity how the same reaction may be applied in quantitative determinations. If phosphoric is used in place of arsenic acid, the coloration is blue or violet. Hydrochloric acid alone gives a rose coloration, but less bright than with the addition of arsenic acid.—*Ad. Carnot.*

THE disposal of town's refuse by sending it in a special sewage steamer eight or nine miles to sea and then dropping it into not less than 16 or 17 fathoms of water, is a method adopted by the Corporation of Liverpool. Messrs. W. Simons & Co., of Renfrew, have just constructed a second steamer to carry 800 tons of sewage—that is, twice the size of the first one, which has now been in use for some time by the corporation with good results. The same method has been practiced at New York for several years.

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The First Electric Telegraph.

The idea of the practical application of the electric telegraph to the transmission of messages was first suggested by an anonymous correspondent of the *Scots Magazine* in a letter dated Renfrew, February 1, 1753, signed C. M., and entitled "An Expeditious Method of Conveying Intelligence." After very considerable trouble Sir David Brewster identified the writer as Charles Morrison, a native of Greenock, who was bred a surgeon, and experimented so largely in science that he was regarded in Renfrew as a wizard, and eventually found it convenient to leave that town and settle in Virginia, where he died. Mr. Morrison sent an account of his experiments to Sir Hans Sloane, the President of the Royal Society, in addition to publishing them anonymously, as stated above. The letter set forth a scheme by which a number of wires, equal to the letters of the alphabet, should be extended horizontally, parallel to one another, and about 1 inch apart, between two places. At every twenty yards they were to be carried on glass supports, and at each end they were to project 6 inches beyond the last support, and have sufficient strength and elasticity to recover their situation after having been brought into contact with an electric gun barrel placed at right angles to their length about an inch below them. Close by the last supporting glass a ball was to be suspended from each wire, and at about a sixth or an eighth of an inch below the balls the letters of the alphabet were to be placed on bits of paper, or any substance light enough to rise to the electrified ball, and so contrived that each might reassume its proper place when dropped. With an apparatus thus constructed the conversation with the distant end of the wires was carried on by depressing successively the ends of the wires corresponding to the letters of the words, until they made contact with the electric gun barrel, when immediately the same characters would rise to the electrified balls at the far station. Another method consisted in the substitution of bells in place of the letters; these were sounded by the electric spark breaking against them. According to another plan, the wires could be kept constantly charged, and the signal sent by discharging them. Mr. Morrison's experiments did not extend over circuits longer than forty yards, but he had every confidence that the range of action could be greatly lengthened if due care were given to the insulation of the wires.

A JARDINIERE, BIRD CAGE, AND AQUARIUM COMBINED.

A correspondent of *La Nature* communicates to that journal a description of a cheap and easily constructed ornamental object that possesses the novelty of being an aquarium, a bird cage, and a jardiniere all in one.

It consists of a large bell glass mounted upon a wooden or iron base, and into the interior of which is introduced a cylindrical glass vessel that has first been loaded with bits of lead or cast iron painted green and other colors, so as to imitate the bed of a spring or clear brook. Upon the bottom of this inner vessel rests a movable perch made of iron rods of small diameter and provided with a foot. The orifice of the cylindrical vessel, as well as that of the bell glass, is covered with wire work having meshes sufficiently wide to admit plenty of air to the birds, while preventing their escape, and sufficiently strong to bear the weight of a row of flower pots.

After the apparatus has thus been constructed birds are introduced into the cylindrical vessel, and gold fish into the water surrounding the latter, while pots of flowers are placed upon the wire work that covers the orifice of the bell glass.

The effect produced upon the spectator by this arrangement is said to be very curious, as the birds seem to be living in the water along with the fish.

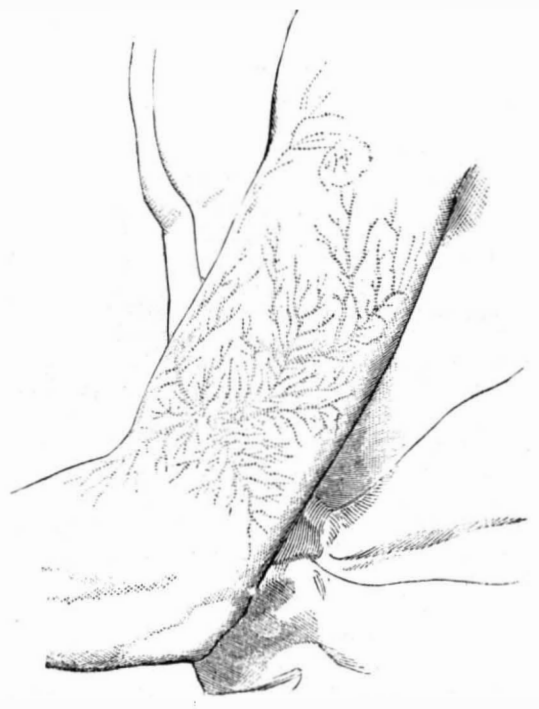
Imported Cattle Disease.

A report of the U. S. Treasury Cattle Commission, under date of August 4, 1883, says that the charges recently made in the British Parliament that American cattle were being received in British ports which were infected with the foot and mouth disease are not true; that the first invasion of the disease into this country was from two English cows brought by way of Montreal, and that "two years ago the steamship France, of the National Line, landed in New York a herd of Channel Island cattle suffering from foot and mouth disease. These were quarantined by the State authorities, and the infection stamped out. The France, however, after an attempted disinfection, shipped a cargo of American beeves for the return voyage, and these, on arrival in England, were condemned as being infected with foot and mouth disease. This was undoubtedly contracted on board ship. The second case is that of the steamship Nessmore, which, in March, 1883, landed in Baltimore a herd of Channel Island cattle suffering from foot and mouth disease. These again were secluded, as soon as detected, by the Pennsylvania authorities, and no evil consequences to our home herds can be traced. But the steamship Nessmore, after an attempted disinfection by the agents, shipped a cargo of American fat cattle, and these, on arrival in England, were found to be suffering from foot and mouth disease. This infection, unquestionably contracted on board ship, appears to have been the main if not the sole occasion of the recent questions and resolution in the British Parliament."

IN Virginia they are making flour of peanuts. In Georgia the nuts are pounded for a pastry.

LIGHTNING PRINTS ON THE HUMAN BODY.

A photograph by Mr. G. Boner, of Duns, N. B., the first of the kind with which we are acquainted, has been shown to us, in which the impression found on the arm of a boy who was recently struck by lightning is most vividly reproduced. An interesting note on the subject will be found in the *Photographic News* of the 6th July. The objections to the popular idea that the delicately traced figures, so very



LIGHTNING PRINTS ON THE HUMAN BODY.

like fern fronds or branches of trees, are caused by the imprint of a near object on the surface of the body are very well put forward. The writer arrives at the conclusion that the markings are caused by the direct action of the electric fluid in paralyzing the nervous system, by causing congestion and redness in the capillary vessels, and the experimental explanation of the tree-like form is clear and satisfactory.—*Lancet.*

[The discharge of static electricity over a very poor conductor, or over a non-conductor when the latter is covered with a film of moisture or dust, assumes an arborescent form, generally spreading in all directions. Discharges of this character from a large inductorium or Holtz machine over a slightly conductive surface are readily produced, and without doubt the lightning picture shown on the arm in the engraving could be readily duplicated by artificial means could a subject be found who would be willing to become a martyr—to that extent—to the cause of science.—ED. S. A.]

BIRDS IN AN AQUARIUM.

Synthesis of Salicine.

Natural salicine occurs in the bark of the willow tree, and is called a *glucoside* because it is easily broken up by the action of dilute acids into glucose (dextrose) and a resinous substance. There are a large number of natural glucosides, but this is the first one that has been produced artificially by synthetical methods. Although, as in all such cases, some of the preliminary steps had been taken by different chemists, the final successful synthesis was accomplished by Prof. Arthur Michael, of Tufts College, Mass.

The substances employed were not those in common use, and we beg our readers not to be frightened by their names, for the substances themselves are perfectly innocent. Helicine, which had previously been prepared by the author from acetchlorhydrose and sodium salicylaldehyde, was dissolved in water and reduced with sodium amalgam. After filtering from mercury the solution was neutralized with carbonic acid and evaporated to dryness, and the residue extracted with alcohol. After several crystallizations the product was found to possess the chemical composition and other properties of natural salicine.

CINNAMIC ACID.

Prof. Michael has also recently produced cinnamic acid by a new synthesis, viz., by heating benzoic aldehyde and malonic acid for several hours in a closed tube at 130°.

Luminosity of Flames.

Sir W. Siemens, in the *Ann. Phys. Chim.*, says that the luminosity of burning gases is a secondary phenomenon dependent on the separation and incandescence of solid particles suspended in the flame. Gases from which no such particles are separated, burn with a feebly luminous flame, and this luminosity is assigned to the incandescence of the gases themselves. No experiments have hitherto been made to ascertain whether pure gases heated to a high temperature really emit light. In order to examine this point the author's brother made a series of observations with a Siemens regenerative oven of the form used in the hard glass manufacture, whereby a temperature of the melting point of steel, 1,500° to 2,000° C., could easily be attained. By a suitable contrivance the interior of the oven could be examined, and it was found that, provided the experimental room was kept perfectly still, the heated air in the oven emitted no light. The introduction of a luminous flame into the oven caused its interior to be only feebly illuminated. As a result of the experiments, it follows that the supposition that the luminosity of the flame is due to the incandescence of the gas is incorrect.

In order to determine the temperature at which luminous waves become non-luminous, the author suggests a repetition of the above experiments with a more refined apparatus. The author further demonstrates that the heat rays emitted from hot gases are very small in number as compared with those emitted from equally hot solid bodies. Observations on the behavior of flames themselves prove equally that the luminosity of flames is not due to the incandescence of the products of combustion. If the gases to be burnt are more quickly mixed the flame becomes shorter, since the process of combustion is accelerated and hotter, since less cold air is mixed with the burning gas. The same phenomenon occurs if the gases are strongly heated before they are burnt; but since the ascending products of combustion are maintained for a short time only at the temperature of the flame, the above phenomenon would be reversed were the gas self-luminous. The luminous part of the flame is separated by a line of demarkation for the products of combustion, and is coincident with the termination of chemical action, which is probably the cause of the emitted light.

If it be assumed that the gas molecules are surrounded with an envelope of ether, then a chemical combination between two or more of the molecules will cause a vibration of the ether particles, which becomes the starting point of the light and heat waves. The luminosity of gases when an electric current is passed through them can be explained in a similar manner, and the author has already observed that all gases are conductors of electricity when their point of so-called polarization maximum has been reached.

New York Stock Quotations Received via Boston.

Much inconvenience was experienced by business men in New York city and in other portions of the country, August 14, by the cutting of the wires that connect the Stock and Gold Exchanges with the offices of business men. But the value of private wires, which were uninjured by the vandals who tried to disable those of the Western Union, was shown by the fact that the private wires of a firm in New York reaching to Boston were the principal means of communication between the two cities for commercial business. The *Sun* says: The firm of H. L. Horton & Co. obtained their quotations very promptly by way of Boston. The gold and stock wires to that city were not cut, and as fast as the figures came out in the Boston branch office of the house they were telegraphed back to the New York offices over the firm's private wire.

THE statistics of Paris lately published establish the claim of the city to be the most cosmopolitan in Europe. Whether it be a thing to be proud of or not, Paris is chiefly inhabited by a population who are not Parisians. Out of 100 residents only 30 are born within the limits of the city; the remaining 70 are provincials and foreigners.

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The Discovery of Luray.

Some time ago there appeared in the SCIENTIFIC AMERICAN an interesting account of the Luray Cave, which an attache of this office graphically described, after visiting it. Since our description of the wonderful cave many thousands of persons have visited it, and it has now become a place of popular resort. A correspondent of the Atlanta *Constitution* tells its readers how the cave was discovered, and how the party making the discovery were deprived of their gain:

A wandering photographer who chanced to be near Luray (then Loraine) was impressed with the belief that there was a cavernous formation in some of the hills that throng about the village. Why he thought so only those who know how thoroughly such a man must study nature and acquaint himself with woodcraft can understand. At any rate, be persuaded to his views a local hunter named Campbell, and the two started out on a systematic and persistent search for a hole in the ground.

For a long time they were unrewarded. One morning, however, they came upon a bowl-like depression in the side of a mountain, from which they thought a vague current of air was issuing. They began picking through the loose stone and sand that made the bottom of the sink, and, after going about ten feet, dropped through an open cavity of indeterminate dimension. A rope was tied around Campbell's body, and he went far enough to discover that the new-found cavern was vast and measureless. The hole was then carefully covered over, and the discoverers, keeping their secret, sought the owner of the land. On a short bargain they bought the land for $100, and took the deeds.

They then disclosed their secret, secured help, and made a thorough exploration of the cave. This exploration opened up the weirdest, most picturesque and marvelous range of underground scenery, in my opinion, in the world. I do not see how anything can surpass it. For more than five miles winding passages lead through vaulted and fluted chambers large enough to quarter a regiment, past pools of crystal water caught in glistening basins, through corridors of enchanting beauty into vast and silent cathedrals and beyond archways, to pass under which a child must bow its head—all filled with stalactites, knolls, and columns, fashioned through the patient and ceaseless work of centuries upon centuries into the most singular resemblances and similitudes that are startling. Nowhere is there a sign of life, except that in one huge chamber a solitary bat flutters in uncertain circles amid the lofty tops of fluted columns. No other bat was seen there—and this one was so wizened and wrinkled that he might have been distilled from the darkness and dungeon like vapors of the cavern—the one blind, and pinched, and chilled evolution of a cycle of gloom and silence. There is one other sign of life—the skeleton of a human being half embedded in the bottom of a gorge. Ages ago this man, of perhaps a race the memory of which does not survive, was doubtless lost in the cavern. Falling into this chasm, struggling against its clammy sides in the utter darkness, and filling the awful stillness with his dying cries, he died alone. And now holiday crowds of a race as strange to him as the phantoms with which his last terrors peopled the blackness of the cave pause with laughing speculation over his bones, and the feet of children run trippingly over the ways where he perished so helplessly.

As soon as the railroad people became satisfied of the extent and beauty of the newly discovered cave, they organized a company with a capital of $100,000, and bought the cave from Mr. Campbell and the photographer. The price given was $40,000; but before it was paid over the former owner of the land, who in his ignorance of the cave had sold it for $400, moved to set his sale aside on the ground of fraud. He contended that he had sold simply the top of the ground, and not what was under. The courts decided he was right, and ordered the $40,000 paid to him instead of the discoverers. These latter got nothing, and Campbell is now a guide for the company on a salary. After paying $40,000 for the cave, the company built the Luray Inn, a perfect model of a Swiss hotel, at a cost of $50,000. A charge of $1 is made for entrance to the cave, and last year 25,000 persons paid this fee. Excursions are run twice a week, and bring from 300 to 600 people on a train.

Special Forms of Gelatine.

Mr. F. Dawidowsky writes that gelatines prepared for special purposes can be designated as specialties. There are two kinds of sufficient importance to be mentioned, one called bouillon stock, and the other chrom-gelatine; the former finds use in the culinary arts, the latter in various other arts (including photography).

Before accurate physiological investigations had proved that gelatine possessed very slight nutritive value, it was supposed that there was no more strengthening food than meat which had been boiled until it formed a soft mass like jelly. As this contained all the constituents of the meat and was quite soluble in water, it was thought that a strengthening broth could be prepared by dissolving it in hot water. As this extract was first made in France, it was called bouillon.

A solution of this jelly in water is by no means the same thing as a freshly prepared meat broth, or bouillon, for the latter contains only those constituents of meat which are soluble in hot water, a meat extract, while the bouillon stock contains, in addition to these substances, part of which have already begun to change, the whole quantity of muscular tissue originally present as such, but now converted into glue.

The preparation of this bouillon stock is as follows:

Perfectly fresh ox beef is chopped fine, all the sinews and bits of bone carefully removed, and then put in *cold* water containing 4 or 5 per cent of salt, and heated to boiling.

It may be boiled in an open vessel, but then it is absolutely necessary to stir the mass continually to prevent its burning fast to the bottom of the kettle. When working on a large scale, it is far better to boil it with steam.

At first a considerable quantity of brownish scum rises to the surface of the liquid. This should not be skimmed off, but stirred in. The boiling is continued until the muscle fibers of the meat are completely dissolved and a sample of liquor, when cooled, solidifies to a very stiff jelly, which does not yield to the pressure of the finger end.

To give it a convenient shape for use it is poured into small tin moulds, where it solidifies in tablets of the size and shape of cakes of chocolate. When these cakes are dried in heated chambers, they become hard like horn.

When one of these cakes is put in hot water, it dissolves to a light brown liquid in which float little delicate flakes of coagulated albumen. In its chemical nature this broth consists of a gelatine solution containing the soluble constituents of meat so far as they are unchanged by boiling.

Since the slight nutritive value of gelatine has been recognized, bouillon stock has nearly gone out of use, and the more so since Liebig's meat extract offers a substance which contains, in reality, all the easily soluble and, therefore, strongly nutritive constituents of the meat, and only needs to be dissolved in warm water, with the addition of some salt, to produce a liquid of the same nutritive value as good beef broth.

CHROM-GELATINE.

If a solution of gelatine is mixed in the dark with a solution of some soluble chromate, *e. g.*, bichromate of potash or ammonia, or with a salt of chromic oxide, as a solution of chrom alum, no other change takes place except in color, the chromates coloring the gelatine an orange red, the chromic salts purple or violet.

If, however, thin layers of chrom-gelatine are exposed to the action of the sun's light, the gelatine will become insoluble in water without losing the property of swelling up in water. Although the chemical change which the gelatine suffers in this case has not yet been explained, a very important use is made of the property in the arts for reproducing pictures.

If a solution of very pure gelatine is mixed in the dark, or in a room illuminated only by chemically inactive light, such as orange yellow, with any chromate, and the solution be then poured on plates of glass, it will form, when dry, a thin film of gelatine on the plates. When one of these plates is covered with an ordinary photographic negative and then exposed to sun light, the gelatine will become insoluble in places where the light has unobstructed access, while it remains soluble elsewhere.

After a plate has been sufficiently exposed to light it is placed in warm water, where the insoluble gelatine merely swells up, while the soluble portion dissolves. When the plate is dry it exhibits the picture of the photograph that was copied on it in relief and of insoluble chrom-gelatine. The gelatine plates can be immediately rolled with printing ink and printed in a printing press, or they may be electroplated and copper printing plates prepared from them. *Wiener Gewerbe Zeitung.*

Heating Railroad Cars.

There is still a demand for a first-class heater for railway cars. In a lengthy article on the above subject the *Railroad Gazette* recommends, as preferable to the present style of stoves now quite generally used, the substitution of cylindrical stoves made of boiler iron, the longitudinal seam welded instead of being riveted, and the top and bottom heads welded in like the reservoirs of the Westinghouse brake. The inside could be lined with fire brick, or it could have a cast iron fire pot. It should then be bolted down, not with a few lag screws, but with strong three-quarters or seven-eighths inch rods passing over the top of the stove and down through the floor, with proper nuts and washers underneath the sills. In order to protect the sides of the car from the heat of the stove it could be inclosed with a cylindrical casing made of tank iron, with a liberal space, say six or eight inches, between it and the stove. This might be open at the top and bottom, and the lower edge should be raised and have an open space between it and the floor of about six inches. The effect of this would be that the air between the stove and the casing would be heated and would rise and thus draw in the cold air next the floor, which in turn would be heated and would also ascend. Above the stove, and in the end of the car, above the end window, a suitable ventilator could be placed, with slats which incline upward, so that the current of cold air as it enters would be directed upward and would mingle with the ascending current of hot air from the stove, and would then be distributed through the car.

This arrangement, it is believed, would heat the car very effectually, and with a reasonable degree of uniformity; it would give good ventilation, and it would be much less liable to set the car on fire in case of accident than the ordinary heaters are, and lastly it would be cheap and simple. It is not claimed that the plan has all the advantages which some of the other systems possess, but it is believed that cars could be heated very satisfactorily with such an apparatus.

Limit of Hearing.

This subject has recently been studied by M. E. Panchon, and his results have been communicated to the French Academy of Sciences. The notes were produced by a powerful siren of the kind invented by Cagniard-Latour, and actuated by steam. The highest audible notes produced in this way had 72,000 vibrations per minute. M. Panchon has also vibrated metal stems fixed at one end, and rubbed with cloth powdered with colophane. In diminishing the length of the stem the sharpness of the note is increased. Curiously enough he finds that the length of stem giving the limiting sound is independent of its diameter; and for steel, copper, and silver the lengths are in ratio to the respective velocities of sound in these metals—that is to say, as 1,000 for copper, 1,002 for steel, and 0·995 for silver. Colophane appears to be the best rubbing substance. When the acute sound ceases to be heard, the sensitive flame of a gas jet is still affected by it.

While upon the subject, we may mention that Mr. Francis Galton has recently invented a "hydrogen whistle," which enables him to obtain notes far above the upper limit of human hearing, his object being to test the hearing powers of insects, which, as is well known, have very acute ears. The number of vibrations produced by a gas in a whistle is universally proportional to the density of the gas, and as hydrogen is thirteen times lighter than air the sounds produced by it in a given whistle are thirteen times shriller—that is to say, the pitch is thirteen times higher. Mr. Galton has made a whistle 0·14 inch long and 0·04 inch in diameter, which with hydrogen gas gives a sound of 312,000 vibrations per second. The whistle is fitted with a piston at its base to regulate its length, and it is probable that still higher notes can be obtained with a shorter length.

Oil of Birch.

(BETULA LENTA, *Lin.*)

A thorough chemical investigation of the composition of the volatile oil of birch has never been made, although in 1844 Proctor first found it to contain salicylic acid, and from the similarity of the properties of this oil with those of oil of gaultheria he suggested the idea of an analogous chemical composition of the two oils.

Nothing more was written upon the subject until 1882, when Mr. G. W. Kennedy, of Pottsville, made some experiments with it, by which results were obtained indicating the presence of salicylic acid, and by which the identity of the oil with that of gaultheria was presumed.

In 1843, Proctor made a series of experiments with oil of gaultheria, and in the following year M. Cahours made a careful analysis of it, and found it to consist of salicylate of methyl, together with 10 per cent of a terpene.

The oil used in this analysis was obtained through the kindness of Mr. Kennedy, and, being distilled by a friend of his, an oil of absolute purity was thus guaranteed.

The oil of birch when freshly distilled is a bright and colorless liquid, of considerable refractive power; it possesses a very agreeable and fragrant odor, closely resembling that of gaultheria, although a difference can be perceived when the two oils are compared. With age, the oil acquires a reddish color, of which, however, it is deprived by distillation. It has a specific gravity of 1·180 at 15°C. (59° F.), and its boiling point is constant at 218°C. (424·4° F.).

A portion of the oil when shaken with a concentrated solution of sodium bisulphite afforded no crystalline compound, thus proving the absence of an aldehyde.

H. P. PETTIGREW.

The Cholera.

Dr. John Roche, an English physician who has had remarkable experiences, gives as his conclusion that cholera is purely and simply a specific fever, only inferior in its ravages to yellow fever, and closely allied to it. Cholera has a period of incubation varying from two to fourteen days: prone to attack the enervated and those subject to depression from any cause. It is contagious, and liable to occur periodically about every ten years in some parts of India. It seems to have visited the British Isles about every sixteen years, and as the period has elapsed since the last outbreak, it is more than likely to occur this year. Those persons who indulge in no enervating habits, and take nothing internally which would arrest the secretions nor too drastically stimulate them, and partake of nothing which is highly fermentable, may safely feel that they are cholera-proof during an epidemic.

Progress of the Telephone.

Professor Bell, the electrician, is reported as saying in a recent conversation that there are more than 500,000 telephones in use in the United States, and the manufacturers are unable to supply the demand so as to keep abreast of orders. He said that the progress of the telephone would have been greater but for the opposition of the telegraph companies, who regarded it as, in part, a competitor instead of an ally. In other countries the telegraph companies had very generally adopted the telephone as an auxiliary, especially at city branch offices and at small offices in the country. Professor Bell said that the science of electricity was still in its infancy. He was constantly engaged in further investigations. Incidentally he was preparing a catalogue of books, pamphlets, and even short articles on the subject, with a view to facilitate his own investigation and those of others. He had the titles of 40,000 such productions already.

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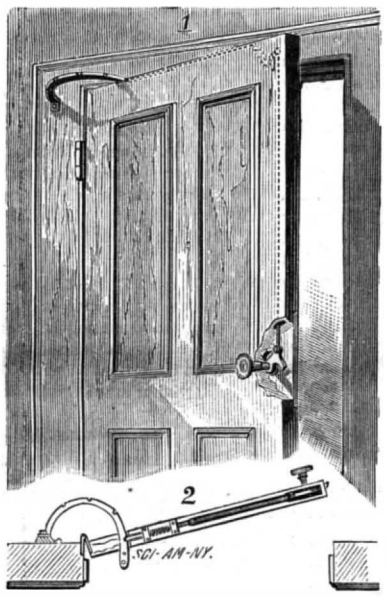
RECENT INVENTIONS.

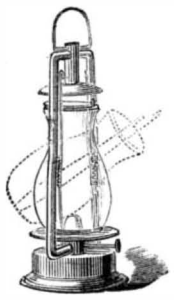
Improved Door Check.

In the door check shown in the engraving a notched semi-circular bar concentric with the door hinge is secured to the upper part of the door casing, and the door is grooved along its upper edge to receive a spring bolt which may lock into any of the notches in the circular bar. The bolt is connected by a bell crank lever in the corner of the door, with a vertical rod connected with a crank arm mortised in the door, and having an external knob by which it may be turned. The crank arm is also provided with a check arm which limits the motion of the crank arm, stopping it just as it passes the center, so that it will hold the bolt in an unlocked position. By means of this simple contrivance the door may be locked at any desired angle, or the bolt may be secured in a withdrawn position, so that the door may be opened or closed as if no check had been applied. Fig. 2 is a view of the top of the door. This invention has been patented by Mr. Thomas B. McCurdy, of Lancaster, Texas.



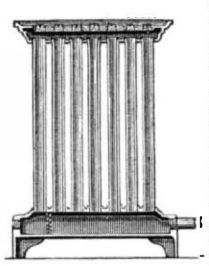
Improved Lantern.

The upright tubes, base burner, top, and handle of this lantern are of ordinary construction, except that the burner is provided with the plate for supporting the globe, and the side tubes have secured to them slotted barrels, inclosing coiled springs that rest upon the trunnions of the globe frame, for holding the globe frame down upon the plate attached to the burner. The globe frame is composed of a lower ring which receives and holds the bottom of the globe, the side uprights having the trunnions formed upon them, and an upper ring that receives and holds the upper end of the globe. This upper ring is made open, permitting the globe to be easily taken out of the frame and replaced. This improvement renders cleaning and lighting the lantern very simple and easy, and admits of easily replacing a broken globe. Mr. James Fanning, of Salem, Mass., is the patentee of this invention.



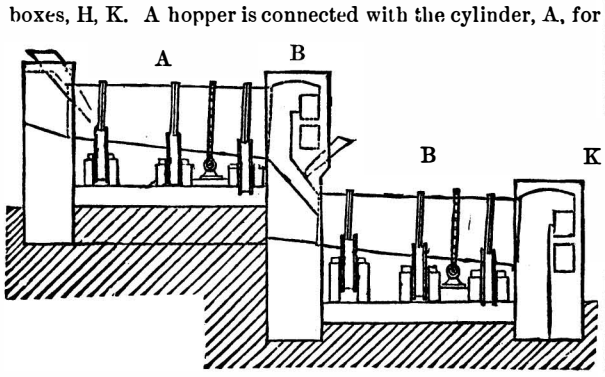
Improved Radiator.

This radiator is designed for steam and hot water, and its novelty consists principally in the arrangement of a subdividing partition in the base and in a top chamber secured to the upper ends of the radiating tubes by expanding in a way similar to the method of securing boiler tubes in the heads of boilers. The top chamber is provided with screw plugged apertures opposite each tube, through which the tools are inserted for expanding the upper ends of the tubes. This invention has been patented by Mr. Thomas McAvity, Jr. 13 King St., St. John, New Brunswick, Canada.



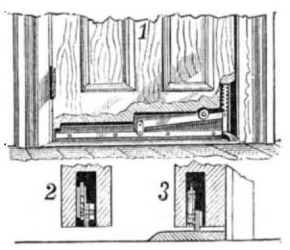
Ore Roasting and Chloridizing Furnace.

The engraving shows an improved ore roasting and chloridizing furnace recently patented by Mr. R. A. Neven, of San Francisco, Cal. (Box 2361). This furnace has two revolving cylinders, A B, the latter being connected with the stack by a flue. These cylinders are connected with the fire boxes, H, K. A hopper is connected with the cylinder, A, for the introduction of salt into the ore. It is stated that this furnace has been running for some time at the Navajo Independence Mill in Tuscarora, Nev., and that it has been ascertained that the furnace effects a great saving working up to 94 per cent of fire assay and using 25 per cent less salt than the ordinary methods of chloridizing.



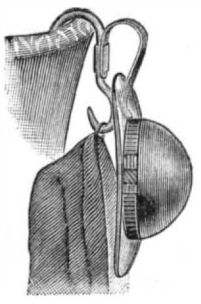
New Weather Strip.

This weather strip is fitted to a groove in the bottom of the door, and is suspended from a spring-acted lever pivoted in a mortise in the door, and capable of raising the weather strip when the door is open. A bolt pivoted to the end of this lever strikes a cam block secured to the bottom of the door jamb when the door is closed, and forces the weather strip into contact with the door sill. This device is readily applied to a door, and is effectual in making a close joint between the door and sill. Fig. 1 shows the strip in place in the door, the door being broken away. Figs. 2 and 3 are vertical transverse sections of the weather strip. Mr. Thomas B. McCurdy, of Lancaster, Texas, is the patentee of this invention.



Vest Pocket Coat and Hat Rack.

The engraving shows a very compact and handy device, which answers the purpose of a coat and hat rack, and may be very readily carried in the pocket. The cut shows it in use, the hat being held by the spring clamping it against the back of the hook, and the loop on the coat being placed on the hook at the lower end. The upper hook is designed to be placed on the back of an opera chair or other convenient support. When not in use the spring is folded into the larger hook, its free end covering the smaller hook. In this condition it may be readily carried in the pocket. The hook shown in the cut is about one-third actual size. This useful invention has been patented by Mr. W. R. Cole, of Pottsville, Pa.



Artificial Light.

At the Parkes Museum of Hygiene, London, Captain Douglas Galton lectured recently upon "Recent Improvements in Artificial Lighting, and their Bearing upon the Purity of Air in Rooms." There was a large attendance at the lecture, which was presided over by Sir Joseph Fayrer. In beginning his lecture, Captain Galton remarked that the vast improvements which had taken place in the production of artificial light in recent years, improvements which bore to a considerable extent upon the hygienic aspect of the question, made it especially desirable to bring the subject before the public. The introduction of the electric light had stimulated invention in gas lighting, and there had been recently introduced new methods of gas lighting which bade fair to retard the universal introduction of the electric light for domestic use. Every form of matter, when sufficiently heated, had the power of emitting rays of light, and thus became self-luminous. This was called incandescence, and all artificial sources of light depended upon the development of light during incandescence. For the illumination of our streets and houses at night, use had hitherto been made of a combustible gaseous combination of carbon and hydrogen, which was the chief constituent of ordinary coal gas. When this hydrocarbon burnt it underwent partial decomposition, and evolved heat. Carbon was separated in the solid state, and floated in a finely divided and incandescent state in the interior of the burning vapor, and this constituted the flame. Looking back at the gradations of improvement which had taken place in artificial lighting, it was found that each successive step had been of advantage to the purity of the air; and he proceeded to trace the various improvements which had been made in the means of lighting from the earliest ages. The more imperfect the combustion of any sort of artificial light, the more deleterious was its effect upon the air of the room. Dealing with the different systems of electric light, he said the arc light with its dazzling brightness was subject to fluctuations, from the fact that the carbon points were continually wearing away, and the constant necessity of shifting them rendered the light often unsteady. Further, it was not pleasing in color, and it had been alleged against it that it produced a great quantity of nitric acid. In the incandescent light the electric current was employed to heat the carbon so as to make it incandescent, and thus use it as a source of light. He remarked in conclusion that the electric light would probably supersede all others, but it was probable that the great advance which had been made in illumination by means of gas might enable that material still to hold its own for some time longer. The lecture, which was illustrated with practical experiments, was listened to with marked attention. Sir Joseph Fayrer, speaking in the course of a brief discussion which followed, agreed with the view expressed by the lecturer that the electric light was the light of the future. He looked with horror upon the present abominable condition of nearly all theaters and public buildings, and remarked that it could not but be expected that people should look for another and a better form of light than that at present in common use.

Ozone as Anæsthetic and Hypnotic.

Prof. Binz, of Bonn, has made a series of experiments upon the physiological effects of pure ozonized air. He did not prepare the ozone which he employed by chemical means, as ozone prepared in this way contains many impurities, but by electricity, using a tube made by Werner Siemens for the silent discharge. The tube was an inch in diameter and a foot long, and was operated with four Bunsen cells and an induction coil that would give a spark nearly an inch long when the battery was in good order.

The ozone tube was connected with a chloride of calcium cylinder charged with eight inches of coarsely powdered chloride of calcium between plugs of glass wool. The air to be ozonized had to pass through this tube, which filtered and dried it sufficiently; the former is of importance for the purity of the ozone, the latter for the quantity.

The ozone thus prepared, when conducted into water recently distilled over permanganate of potash and then made slightly alkaline, did not show a trace of nitrous or nitric acid. A second experiment gave the same result.

We cannot go into all the details of the precautions used in its inhalation and the apparatus employed. Experiments made upon the lower animals showed that an apparent sleeping state could be produced before the air passages were irritated by it, and this was more distinctly noticed in men. The breathing before sleep began was quiet and full, the persons experimented upon said that it was easy and comfortable, and the passage from the waking to the sleeping state was a feeling of the most agreeable indifference. The pulse never exhibited any perceptible change during the experiment, nor was there any alteration in the pupil of the eye or the color of the face. If the quantity of ozone inhaled is too large, from the apparatus working too fast or the tube being too near the nostrils, it may excite very violent coughing, nausea, and choking, but not the slightest sensation of local irritation in the chest is perceived.

In all observations hitherto made as to the effect of ozone on men, they have only described the irritating effect on the air passages resembling those of chlorine. The reason of this was that the ozone was not mixed with air in suitable proportions, and in most cases also to impurities in the ozone used. In the former respect Binz compares ozone to alcohol, which used in its concentrated form irritates the mucous membranes violently, destroys the epithelium, coagulates albumen, etc., but when very dilute scarcely exerts any perceptible influence on them.

Owing to the very transitory effect of ozone, it will never take the place of nitrous oxide for anæsthesia for surgical purposes. Binz himself does not lay much weight upon the practical importance of the ozone sleep, but hints that further experiments in this direction may lead to important results. —*Pharm. Centralhalle.*

[Perhaps the ozone in mountain air increases its hypnotic and hence invigorating effects. Cannot pure ozonized air be used for sleeplessness in some cases?—ED.]

Rolling Molten Iron.

Alluding to the proposed establishment of a rolling mill for rolling molten iron and steel, *Iron* says that the idea is not a new one, a similar attempt having been made some time ago by Sir Henry Bessemer. In the arrangement as brought out at that time, sheet metal was to be made directly from the converter by pouring the molten metal between two revolving rolls. So long as the supply of steel was properly maintained and the rolls worked freely without meeting any obstruction, a continuous sheet of metal of good quality was obtained, and the product, when worked up, was said to give very satisfactory results. However, it is by no means difficult to point out elements of weakness in the method, and to these it is probably due that the rolling of liquid metal never seemed to meet with much favor. Prominent among them is the item of a continuous supply, as it is clearly apparent that anything producing a check in the flow of metal would lead to a more or less complete dismantling of the whole train. The destructive action of the highly heated metal upon the rolls, tending to produce rough surfaces, is another point of considerable importance, especially in turning out sheet metal, where irregularities, however slight, are necessarily fatal to good results. Another disadvantage is found in the difficulty of keeping the liquid metal free from such impurities as slag, etc., from the ladle, which, when worked into the sheet, would necessitate the cutting away of large portions, thus entailing considerable waste. Even in view of all these difficulties, however, the operation of rolling molten iron or steel is not impossible of execution.

Improvement in Photo-Mechanical Printing.

When a collotypic picture is transferred to stone for lithographic printing, or to metal for etching into a typographic block, the details are apt to clog during the first inking, owing to fatty matter round the ink becoming pressed out. A recent improvement of Mr. Swan, however, yields a transfer with a grain clearly and sharply defined so as to print well from a stone, or yield a transfer capable of being inked on zinc or other metal. The method consists in inking the collotypic plate before soaking it in water, and as the gelatine softens in parts, the ink is removed by sponging. During this operation the ink breaks up into a clear grain free from the halo of grease referred to above. The process is not patented, and promises to give an impetus to photo-mechanical printing.

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ENGINEERING INVENTIONS.

A car coupling intended to promote security in coupling has been patented by W. I. Byard, of Little Falls, N. Y. The coupling is very simple in its construction, and so made that a car using it can readily be coupled to one having the link and pin coupling in ordinary use.

Mr. H. M. Glines, of East Boston, Mass., has patented an improved car brake, in which the brake bars are connected by a rod to the lower end of an arm of a shaft on another bar, which shaft has an upwardly projecting arm connected to the brake shaft. The brake shaft is provided with an apertured disk and with a sliding collar. A pin is passed through the apertures in the disk, whereby the brake shaft may be locked in any desired position.

Mr. William Whitely, of Housatonic, Mass., has patented a device to facilitate the adjusting and leveling of the roll in rag engines, and also to allow the roll to be conveniently raised and lowered while in motion. With the long arm of the rock shaft is also connected a chain and a vertical shaft provided with a ratchet wheel and pawl, so that by operating the said shaft the lighters and roll will be raised and lowered with a quick movement.

An improvement in car brake dogs has been patented recently by Mr. J. H. Pitard, of Mobile, Ala. A spring is used in connection with the pivot of the car brake staff dog, which causes the dog to engage automatically with the ratchet wheel of the staff, and lock it when set to hold the brake to its work. The means being very simple for causing the dog to engage quickly, the inventor believes that many accidents might be avoided by the introduction of his invention upon railroad cars generally.

Messrs. Thos. Ashbury, Herbert Sumner, William Lees, and Richard W. B. Sanderson, of Manchester, England, have patented a very simple and said to be effective gas engine. Two engines are located relative to each other, and rest equally on the bearings of a main shaft. The twin engines are mounted on one frame, so that the running parts will be perfectly balanced at any speed and the steam will be distributed equally, even when the explosion of the gas is permitted.

An improved car coupling has recently been patented by Mr. Squire Richard Jones, of Lacon, Ill. A hook coupler is located in the drawbar, and arranged to swing down to open for receiving the link, and provided with a crank device to be thrown down by the shock of the cars when they come together, or by hand to raise the hook and engage the link. A crank device for raising the link for coupling cars of different height, an improvement in the construction of the link to increase its strength, and for enabling it to be held up by the hook for self-coupling, is provided.

A rotary steam engine of novel construction has recently been patented by Mr. John Andrew Knight, of Marlborough, N. H. The rotating wheel carries a series of steam cylinders containing pistons and piston rods for rotating crank shafts journaled in the wheel. These crank shafts carry cog wheels which engage with a fixed cog wheel on the frame, whereby when the steam is admitted into the cylinder the cog wheels on the crank shafts will be rotated, and, as they engage with the fixed cog wheel, the wheel on which the cog wheels are mounted will necessarily rotate.

A patent has recently been granted to Mr. I. S. Freeman, of Balsam Lake, Wis., which relates to traction engine carriages of ingenious design, and intended to be propelled by steam. A car carrying the propelling machinery and fuel is supported within traction wheels of large circumference. The entire load is carried on the inside of two large traction wheels and confined by sheaves, guide wheels, or rollers, so that the weight is placed at the greatest possible distance from the center of the traction wheels, and in a frame of limited dimensions, so as to offer no obstruction in traveling over uneven roads.

Mr. Noah Jackson, of Grelton, O., has patented an improved traction engine, having vertical side frames formed with rounded ends. Around the edges of these frames are endless tracks, and upon each side there is also an endless chain provided with rollers that rest upon the tracks. Between the rollers the chains are fitted with blocks which serve as legs for support of the sides and platform. The chains and blocks together form an endless track upon which the engine is supported and moved forward. The chains are driven by sprocket wheels which receive their power from the engine. The engine is provided with an ingenious device by which it is turned or guided.

MECHANICAL INVENTIONS.

Mr. John Q. Day, of Red Cliff, Colo., has recently patented an improved railroad snow plow. The invention consists of a rotary plow provided with knives or scrapers to gather the snow into annular channels of the drum or wheel, carrying the snow to the top of the drum or thereabout, discharging it from the channels, and throwing it off at the sides of the road.

A useful improvement in discharge pipes for dredging sand pumps and other machines has recently been patented by Mr. James M. Buckley, of Portland, Oregon. The novelty of the invention consists in a revolving discharge pipe, whereby the material passing through it is prevented from settling therein, rendering the quantity of water usually required to force the earthy materials through the discharge pipe.

Mr. Joseph Schneible, of St. Louis, Mo., is the patentee of an improved glue cutting and spreading machine. A reciprocating cutter is attached to the jelly box and a frame mounted on a traveling belt receives the slices as they are cut. To prevent the glue jelly from sticking to the drying plates, the inventor fits to the side of the jelly box other open bottomed boxes containing fibrous material soaked in water.

Mr. J. H. Moon, of Fallsington, Pa., has patented a pottery lawn constructed with a shaft having eccentrics connected by pitmen, with the lawn frames suspended by hinged hangers from bars attached to the frame of the machine. The rear ends of the supporting bars are connected with hinged screws, secured adjustably to the top bars of the frame of the machine, so that the inclination of the said lawn frames can be readily regulated.

Mr. Francis M. Shields, of Coopwood, Miss., has patented an improved machine gun for war purposes, especially adapted for use in forts and upon fields for resisting charges by troops in mass. This improvement consists in a series of radiating barrels and an improved multiple charge shell holder, which may be readily and easily removed and replaced. A number of such holders are provided, and as soon as the cartridges in one have been exhausted it is replaced by another.

A novel machine for inserting pins or rivets in umbrella frames has been patented by Mr. Daniel M. Redmond, of Philadelphia, Pa. This machine is provided with a guide for holding the parts of the umbrella frame over the end of a continuous rivet wire and with a follower for pushing the parts down upon the wire, and with cutters for cutting the wire after it has been inserted. There is a feed motion which carries forward enough wire for a rivet at each movement of the machine.

A simple and effective brake applicable to pulley wheels and shafting has recently been secured by letters patent to Mr. E. E. Glover, of Terre Haute, Ind. The invention consists in a ball partially incased in a box, one side being partially open, allowing the ball to come in contact with the wheel or pulley and act as a brake. The wheel can move in one direction but not in the reverse while the ball is in contact. A spring is provided for holding the ball free from the wheel when the brake is not required.

Messrs. J. H. and D. Meltzer, and J. J. Baker, of Metzer, Ind., are the patentees of an improved straw stacker. The machine, which is mounted on wheels, is provided with an endless carrier which conveys the straw, and at the same time the beater fan forces the straw and chaff upon the carrier and prevents any portion falling back. Wire fingers are also provided to prevent the wind from blowing the straw away when it falls from the separator on to the lower end of the carrier.

A steering apparatus, whereby the rudder can be controlled and operated by one man, even in heavy weather, has recently been patented by Mr. R O Toole, of Perth Amboy, N. J. With the steering wheel shaft is connected, by a pair of gear wheels, a drum to receive the rudder chains, the said drum being placed upon a shaft connected at one end with the rudder wheel frame, and at the other end with a bracket on the vessel's deck. It is claimed that by this very simple arrangement of the wheel, the labor of steering a vessel is greatly diminished.

A machine for grading or leveling earth in the construction of railroads or earthwork embankments of any kind, by which great economy of labor is accomplished, has recently been patented by Mr. J. M. Buckley, of Portland, Oregon. Adjustable plows or levelers are connected to a platform car. The latter is pushed along the track, forcing the dirt which has been deposited from a train to the side of the track, where it is distributed and leveled in a most complete manner. The machine may also be used for widening cuts through snowbanks.

A grinding apparatus for sharpening the knives of mowing and reaping machines is the subject of a patent recently granted to Mr. John Rentz, of Quincy, Ill. The emery wheel or stone used for sharpening is attached to a flexible shaft, enabling the grinding surface to be brought in contact with the knife at any desired angle, the latter being held by a clamp. The grinding wheel is revolved by foot power. Provision is also made for inserting boring, carving, or other tools in a socket at the end of the flexible shaft. This enables the same machine to be used for a variety of purposes.

AGRICULTURAL INVENTIONS.

Mr. P. W. Williams, of Dardanelle, Ark., has recently patented an improvement in cultivators for throwing up the soil and preparing beds for the planting of cotton or other crops planted in drills or rows.

An improved harrow tooth has been patented recently by Mr. I. H. Reiner, of Line Lexington, Pa. The tooth has a straight shank and a bent point, the latter extending about one-third of the tooth. Attachable heads are used to allow the reversing of the teeth in the frame, so as to change the angle of the teeth when desired.

An improvement in sulky plows has recently been patented by Mr. Jacob L. Runk, of Nashville, Ill. The axle is of the cranked pattern, and by a lever the furrow wheel is shifted up and the plow down. When the plow is to be let down into the ground, and when raised out of the ground, the lever is brought into action, which will depress the furrow wheel, also the landside, and at the same time raise the plow. The plow is at all times in a level condition transversely to the sulky.

Mr. Joseph V. Harter, of Denver, Ill., has patented an improved ground pulverizer and stalk cutter, which is composed of three cutters provided with spiral knives whose edges project vertically. Two of these cutters are axially in line with each other, but separated about the length of the third, which revolves in a frame jointed to the axle and projecting rearward. When the apparatus is drawn forward, the rotary cutters are revolved by contact with the ground, and the blades act to cut or chop the stalks, or in the same manner to pulverize the ground and level it as required. The cutters are in position to act upon different rows, so that three rows can be operated upon at once.

An improvement in sulky plows has been patented by Mr. Benjamin F. McCray, of Hamlin, Kas. The running gear of this plow is provided with a compensating device which prevents the plow from being affected materially by the running of the wheels over uneven ground, because the bar by which the draught is applied to the plow will shift in slots in the axles as the wheels rise and fall. By application of the power to the plow beam near to the plow standard, together with a gauge wheel at the rear, the plow will be carried wholly, or nearly so, by the wheels, thus preventing most of the friction on the bottom of the furrow common to most plows.

Mr. L. C. Terry, of Columbus, Miss., has patented recently a cotton bale header for setting up compressed cotton bales on the end or side as desired, as they come from the compress, to facilitate the loading of trucks. A platform is arranged in the floor like a trap door, and being connected with a lever located under the floor, and arranged in such relation to the lower platen of the press that when the press opens for the reception of a bale to be compressed the platen will depress the lever and cause the platform with the previously compressed bale on it to swing up, setting the bale on edge or end as the case may be, and thereby doing the work for which two men are now commonly employed.

Mr. W. F. Burditt, of St. John, N. B., has recently patented in the U. S. and Canada a very useful and ingenious trip mechanism for harvester rakes, whereby the operator can cause every second, third, fourth, fifth, or sixth rake to sweep off a gavel as the condition of the grain may require. The trip mechanism has a screw having sectional threads and connected with the rake head and its gear wheel, and engaging with a counting slide, having a blank section beneath its lowest tooth, so that the said slide will be raised by the screw, and then pushed back out of gear. The counting slide is so connected with the switch latch by a lever and link, that the backward movement of the counting slide will trip the latch, and by its forward movement will throw the counting slide again into gear with the before-mentioned screw. There are other ingenious mechanical contrivances brought into use by the inventor, which with those described above, render the new harvester rake an effective implement.

MISCELLANEOUS INVENTIONS.

A very simple improvement in charcoal stoves has recently been patented by Mr. E. M. Stern, of New York city. The stove is especially intended for heating smoothing irons, shoemakers' irons, etc., but it is also well adapted for cooking purposes.

Mr. Charles Murdock, of New Rochelle, N. Y., has patented a new and improved portable fire escape, which may be quickly and easily put in position for use, which will afford safe and easy descent from the window of a burning building, and which will occupy small space when not in use.

Mr. H. A. Dearborn, of Austin, Minn., has recently patented an ironing table which combines also many other uses, for instance, a clothes horse, a cutting table, scrap bag, child's hammock, etc. It can be adjusted to any desired width and height, and can be folded very compactly when not in use.

Mr. Le Grand Terry, of Dundee, N. Y., has patented an improved rail and rail support for barn doors. The invention consists of a novel knee form rail support with an upwardly bent lip, and with angular braces or plates uniting their bottoms and backs, whereby a light but strong rail support is obtained sufficient to hold up the heaviest door.

Mr. G. A. Ramseyer, of Dobbs Ferry, N. Y., has recently obtained a patent on a piano stool, it being an improvement on his patented stool granted in 1877. The present invention renders the stool more stanch, and by its construction greater latitude for ornamentation is had, and the mechanism for elevating the stool is simplified, and vastly improved.

A convenient form of package for holding bolts and nuts has recently been patented by Mr. S. T. Riker, of Portchester, N. Y. The invention consists of a box to receive the bolts, a tray to receive the nuts, fitted into the box, and a cover inclosing and protecting both box and tray. This mode of keeping the bolts separate from the nuts is very convenient.

An improvement in galvanic batteries has been recently patented by Mr. E. Frank Schlosser, of Hoboken, N. J. The invention consists principally in arranging the carbon plates and zincs in the battery in such manner that both sides of the carbon plates are utilized, thus obtaining greater working surface of carbon in the battery than heretofore.

A self-adjusting ventilator for carrying fresh air to any part of a building has been patented by Mr. D. B. Taylor, of St. Louis, Mo. It combines a receiving funnel with a vane attached, which turns with the wind, and directs the air into the room. Combined with this fan and vane are safety valves for relieving the apparatus of surplus pressure during a heavy wind.

Mr. John E. Evans, of Spanish Fork, Utah Ter., has patented a useful improvement in harness tug hooks, by which the tugs are secured to single trees and held in a secure manner. The hook has a spring tongue pivoted to it, by pressing which between the thumb and finger the hook is readily detached from the single tree.

A press clamp for button flies has been patented by Mr Isidor Felber, of Nyack, N. Y. This press clamp has a stationary base block, to which are pivoted jointed swinging arms, having at their outer ends hand screws provided with swiveled feet, whereby shoe button laps of various sizes can be conveniently and securely held while being scalloped.

Mr. C. C. Kribs, of Trempealeau, Wis., is the patentee of a milk skimming appliance which is placed within the milk can, the milk dripping off through a sieve, leaving the cream in a separate chamber within the can. It is claimed that the skimming of milk is not only facilitated, but a saving of cream is effected. The vessel is gauged, so that the quantity of cream will always be indicated.

Mr. J. B Conlan, of Richburg, N. Y., has patented a device for taking up the slack of power transmitting belts while on their pulleys. The invention consists in a pair of strong stocks, each provided with fixed and adjustable corrugated clamping jaws for gripping the belt near its ends. The stocks are fitted with screws for drawing the ends of the belt together for joining after they are secured in the clamping jaws.

Mr. T. W. Byrnes, of Manitowoc, Wis., has patented a very complete apparatus for draughting garments. The contrivance is composed of forms with scales of measurements thereon for draughting coats, linings for dress waists, etc. These scales are formed of several sections, hinged together, and the division marks are stamped or otherwise impressed on the edges of the scales.

A bench dog, which the inventor claims is better calculated for practical use and has greater durability than those now in use, has been patented by Mr. W. H. Stannard, of Lyme, Conn. The only fitting required in the construction of this bench dog consists of boring the rivet and screw holes and the hole in the arms for the stem of the push bit, fitting in the rivets and providing a spring.

A novel sled, to be propelled by the person riding, has recently been patented by Mr. D. R. Ivett, of Fort Fred Steele, Wyoming Ter. The rider occupies a seat on the sled and with his feet operates cranks, whereby bars which act as creepers are reciprocated. In moving forward, the bars slide over the snow or ice and then catch on the same, and propel the sled forward.

Col. Jean B. Amyot, Deputy Sheriff, of Quebec, Canada, has patented a preparation of asbestos and articles or goods made therefrom. The preparation consists in treating or preparing asbestos or goods or articles made of asbestos, and rendering them impervious to water by mixing or steeping the material or articles in a heated solution of isinglass, gelatine or glue, glycerine, and bichromate of potassium, with or without the addition of silicate of soda.

Mr. Adam Collignon, of Westwood, N. J., has patented improvements relating to folding chairs in which folding X-legs are combined with the pivoted back frame and side arms. The chair may be constructed in all its parts of straight pieces, thereby reducing the expense of manufacture without interfering with the appearance or comfort, and it is made sufficiently short, so that when folded it may be packed in a trunk.

Mr. Ferdinand Ephraim, of San Francisco, Cal., has recently received letters patent for improvements in rubber soles and heels for boots or shoes, the object of which is to devise a practical method of providing rubber soles and heels with metal wearing points or surfaces for increasing their durability. The invention consists in the employment of headed eyelets or rivets that are passed through the outer sole and heel and riveted before being attached to the boot or shoe.

Mr. J. A. Tracht, of Galion, O., has patented recently improvements in hot bed and other frames for plants. The knock down frame has its ends adjustable to suit different widths of sashes. A double frame for better protecting the plants in the bed of the frame from frost is also provided when required, and the entire frame may be not only readily knocked down and put together again, but being adjustable admits of different widths of frame or number of sashes being used.

Mr. Ira B. Gage, of Dowagiac, Mich., has patented recently an improved attachment for self-binding harvesters, to receive the sheaves from the binder and retain them. The attachment is essentially a pair of arms projecting from under the table whereon the sheaves are bound, so as to receive and hold the sheaves crosswise on them as pushed out by the binding mechanism. Also means are provided for swinging one of the arms from under the sheaves to let them fall to the ground when the bunches are to be discharged.

Mr. B. H. Tripp, of Gallatin, Mo., has patented a device for taking up and hauling grain shocks, consisting of a pair of knife-blade shaped runners, and a crib or frame to each runner, pivoted at the rear ends of the runners to crossbars. The runners lie flatwise and with confronting edges, so as to open at the front ends in such manner that, being placed by the sides of the shock and the team started up, the hitching device will first swing the runners together and under the shock and the frame around it, removing the sheaves in a mass, so that they will not have to be handled individually.

An improvement relating to refrigerator cars has been patented by Mr. Chas. P. Jackson, of Chicago, Ill. The ice chamber is entirely overhead, and so constructed that broken ice and salt may be used, or full sized cakes of ice. A flue or opening extends all around the car, protected from the ice by a partition which extends to near the top of the car, that the warm air may ascend and come in contact with the surface of the ice. The ice rests on an open grating, or galvanized iron perforated with holes, the melting being from the under surface. Underneath this is a suspended ceiling, in sections, which supports the pans, so constructed as to be readily raised or lowered, thereby increasing or diminishing the opening for cold air and regulating the temperature of the car at will.

Mr. William L. Caldwell, of Chicago, Ill., has patented a combined calendar, blotting pad, paper cutter, and rule. The advantages of this implement are that it combines four distinct and useful implements for office use in one piece, thus increasing its convenience over the single parts composing it, and its saves much time in hunting up either of the pieces wanted, for they are always together. The body has a stiffener at its back edge, provided with an edge to serve as a paper cutter, and graduated as a measuring rule. A cover is hinged at the inner edge of the stiffener to the body like a book, and provided with an opening exposing a calendar card. An inner card covers the opening and holds the calendar card in place.

Mr. Jinter Hirayama, of Otamachi, Yokohama, Japan, has recently received a patent on a very ingenious and pretty invention which he calls daylight fireworks. Images of birds, animals, or any figure are made of any light material, and when projected into the air and attain a certain height they burst out, showing the design. A shell for use in sending the paper birds skyward is placed in a small cannon or other device for projecting it, with its contents, into the air. The explosion which sends the shell into the air ignites the fuse, and after the shell reaches a considerable height, the charge of powder is ignited. The explosion of this charge fires the paper images out of the shell, and they, being of light material and open at the bottom, become inflated with air, exhibiting the designs as they float gradually to the ground, presenting a fantastic appearance.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Wanted.—Present address of Thos. Symonds, machinist, formerly of Camden, N. J. W. H. C., Box 773, New York.

Wanted.—Boat-builders or others interested to apply and test a (new pat.) canal boat propeller, suitable for N. Y. canals. Address F. M. Marquis, Bellefontaine, O.

Painters.—New pat. Graining Tools for rapid and excellent work. Stamp for cat. J. J. Callow, Cleveland, O.

The Lehigh Valley Emery Wheel Co., Lehighton, Pa., sell a new Stove Plate Grinder, with traverse motion, and an Automatic Planer Knife Grinder, with a cup wheel. Cuts and descriptions sent upon application.

Wanted. To purchase a good patent for the production of iron and steel by use of gas fuel. State price. Box 7, West End, Long Branch, N. J.

Nickel Anodes, Salts, and Platers' Supplies of all kinds. Greene, Tweed & Co., 118 Chambers St., N. Y.

Curtis Pressure Regulator and Steam Trap. See p. 78.

For Pat. Safety Elevators, Hoisting Engines. Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 78.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 76.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423. Pottsville, Pa. See p. 77.

Lightning Screw Plates, Labor-saving Tools, p. 78.

25" Lathes of the best design. Calvin Carr's Cornice Machinery. G. A. Ohl & Co., East Newark, N. J.

The Ide Automatic Engine, A. L. Ide, Springfield, Ill.

Spy Glasses, Telescopes, Opera Glasses, Field Glasses. Send for catalogue. Queen & Co., Philadelphia.

Brush Electric Arc Lights and Storage Batteries. Twenty thousand Arc Lights already sold. Our largest machine gives 65 Arc Lights with 35 horse power. Our Storage Battery is the only practical one in the market. Brush Electric Co., Cleveland, O.

Best Squaring Shears, Tinners', and Canners' Tools at Niagara Stamping and Tool Company, Buffalo, N. Y.

Lathes 14 in. swing, with and without back gears and screw. J. Birkenhead, Mansfield, Mass.

Blake's Patent Belt Studs. Most reliable fastening for rubber and leather belts. Greene, Tweed & Co., N.Y.

The Best.—The Dueber Watch Case.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN Patent Agency, 261 Broadway, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Lists 29, 30 & 31, describing 4,000 new and 2d-hand Machines, ready for distribution. State just what machines wanted. Forsaith & Co., Manchester, N. H., & N. Y. city.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

"Abbe" Bolt Forging Machines and "Palmer" Power Hammers a specialty. Forsaith & Co., Manchester, N.H.

Microscopes, Microscopic Mounting Instruments, and Materials. Send for catalogue. Queen & Co., Philadelphia.

Railway and Machine Shop Equipment.
Send for Monthly Machinery List
to the George Place Machinery Company,
121 Chambers and 103 Reade Streets, New York.

"How to Keep Boilers Clean." Book sent *free* by James F. Hotchkiss, 84 John St., New York.

Wanted.—Patented articles or machinery to make and introduce. Gaynor & Fitzgerald, New Haven, Conn.

Water purified for all purposes, from household supplies to those of largest cities, by the improved filters manufactured by the Newark Filtering Co., 177 Commerce St., Newark, N. J.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works. Drinker St., Philadelphia, Pa.

Stereopticons and Views for public and private exhibitions. Send for catalogue. Queen & Co., Philadelphia.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co. Publishers, New York.

Improved Skinner Portable Engines. Erie, Pa.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 62.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 92.

Steam Pumps. See adv. Smith, Vaile & Co., p. 93.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Drop Forgings of Iron or Steel. See adv., page 109.

Drop Forgings. Billings & Spencer Co. See adv., p. 109.

Diamond Engineer, J. Dickinson, 64 Nassau St., N.Y.

Steam Hammers. Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

50,000 Emerson's Hand Book of Saws. New Edition. Free. Address Emerson, Smith & Co., Beaver Falls, Pa.

Gould & Eberhardt's Machinists' Tools. See adv., p. 109.

Barrel, Keg, Hogshead, Stave Mach'y. See ad., p. 110.

Fossil Meal Composition, the leading non-conducting covering for boilers, pipes, etc. See adv., p. 126.

Helios, Blue Process, Paper; the best made; warranted. Sold at all stationers, or Keuffel & Esser, New York.

Renshaw's Ratchet for Square and Taper Shank Drills. The Pratt & Whitney Co., Hartford, Conn.

Catechism of the Locomotive. 625 pages. 250 engravings. Most accurate, complete, and easily understood book on the Locomotive. Price $2.50 Send for catalogue of railroad books. The Railroad Gazette, 73 B'way, N.Y.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The Sweetland Chuck. See illus. adv., p. 110.

Catalogues free.—Scientific Books, 100 pages; Electrical Books, 14 pages. E. & F. N. Spon, 35 Murray St., N. Y.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

NEW BOOKS AND PUBLICATIONS.

WATER SUPPLY, CONSIDERED MAINLY FROM A CHEMICAL AND SANITARY STANDPOINT. By Wm. Ripley Nichols, Professor at the Massachusetts Institute of Technology. John Wiley & Sons, New York.

This is a handsome quarto of 230 pages, evidently compiled for practical use and not merely as an exhibition of scholarship or of scientific investigation. It treats on drinking water and its analysis; on rain water; surface water; well water; driven wells; cisterns; artesian wells; filtration of water; impure ice; and kindred subjects, and corrects some popular errors regarding potable and drinking waters, and makes excellent suggestions for insuring a domestic and public supply.

PHOTO-MICROGRAPHS, AND HOW TO MAKE THEM. Illustrated by forty seven heliotypes of microscopic objects By George M. Sternberg, M.D., F.R.M.S. James R. Osgood and Co., Boston.

This handsome volume, which the author in his preface, calls "little," although containing over two hundred octavo pages, is intended for beginners in the art of micro photography—a term more definite than the inverse of photo-micrography, chosen by the author. But it is a "growing" book, from first page to the end having something new and increasingly valuable to offer. The reproductions of the photographs of the microscope by the heliotype process are admirable, and present to the untutored eye a series of facts of amazing significance, and possibly of general importance. The book contains the directions for amusement and instruction combined, at a small expense, and tends to guide observers of natural phenomena to the easiest means of gratifying their inclinations.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) C. P. S. asks: Is it possible to construct an engine and boiler that can make *side wheels* drive a steamship with as much power as a *screw* for the same consumption of fuel? A. Yes. On a given amount of fuel a steamer will go faster, in smooth water, with side wheels, than the same engine and boiler will drive her with a screw For river boats, such as are used on the Hudson River, the paddlewheel is the best and most efficient. The efficiency of the paddlewheel depends upon the proper and even immersion of the paddles In a rough sea there is a loss of power in the use of paddle wheels, as the rolling of the ship and the movement of the waves will frequently leave one wheel wholly out of water while the other is unduly immersed. For sea going vessels, on long voyages or rough waters, the screw is much the most efficient on account of the variable draught of water between the beginning and end of the voyage.

(2) C. W. B. writes: I have a great number of seals to make, and would like to have you inform me through the Notes and Queries column of your paper, of a recipe for a cheap, bright light green sealing wax A. Mix 4 ounces shellac, 2 ounces of Venice turpentine, 1¼ ounces resin, half an ounce orpiment, and a quarter of an ounce mineral blue. Another receipt is:

Shellac	24 parts.
Turpentine	4 "
Verdigris	6 "

To be colored as desired with a mixture of yellow and indigo.

(3) H A. S. asks: I think of making some hay caps from cotton cloth; can you inform me ho to make them water and grasshopper proof? A. Use boiled linseed oil thinned with turpentine and allow the caps to become thoroughly dried before using.

(4) W. F. C. asks: What is used in imitating turtle shell? See J. J. B.'s question, No. 22, June 2, question No. 20. A. The proportions necessarily vary with the character and intensity of the effect which it is desired to produce. We would recommend you to use a pretty strong solution of silver nitrate, say 1 part of the salt to 6 of water, and then dilute it as you find necessary 2. Also in forcing water into a tank at the bottom, isn't the pressure greater than to force it over the top? A. The pressure is less in forcing water through the bottom of the tank, as the height of the water column is less.

(5) M. A. S. writes: I have a silver cornet, the bell and mountings of which I wish to gild. Will you please inform me through the column of your valuable paper, the SCIENTIFIC AMERICAN, if there is a wash or other means of doing it, and what it is? I wish to avoid the use of a battery if possible. A. Dissolve 9 parts gold chloride in 1,000 to 2,000 parts distilled water; then add 360 parts potassium bicarbonate and boil for two hours. The metallic article must be coated with a film of copper simultaneously with its being immersed into the boiling gilding liquor, by placing a piece of sheet copper along with it. As soon as the deposit of copper is observed, the piece of copper is taken out, and the liquor continued boiling until a deep yellow color is obtained. The article is then taken out, washed off with water, and rubbed with a metallic brush. When the liquor has again become clear by settling and decanting, it is once more heated to boiling and the article immersed, while the piece of copper is moved about in the fluid without touching the other. This operation is repeated until a coating of sufficient thickness is obtained.

(6) J. S. B.—Consult Prescott's "Electricity and the Electric Telegraph" and "The Telephone Electric Light, and other Electrical Novelties" by the same author. Gordon's "Electricity and Magnetism" is a good work. No remedy for induction has been found; as a rule, whatever reduces the effects of induction also diminishes the power of the telephone.

(7) R. H. P. says: After considerable experiment I have succeeded in making a paste for matrices that gives us from 40 to 80 casts, average perhaps 50 to each matrix. I use two ounces of French gelatine dissolved in vinegar, then add to this one ounce alum and one quart hot water. In a separate vessel dissolve one pound starch in cold water. Then bring the water in which is dissolved the gelatine and alum to boiling point, and gradually stir in the dissolved starch, stirring all the time to prevent lumps. Boil half an hour, stirring all the time; when cold, to a pint of paste add water and one ounce of Spanish white to make matrix; use enough water to the paste so as to spread well.

(8) J. E. N. writes: We have in this village a local telegraph line, about three miles in length. We use No. 4. galvanized wire and Morse instruments wound to 20 ohms resistance (without relay). We have now twenty-five of these instruments on the line. I wish to inquire how many instruments can be placed on the line without materially increasing its length, or whether there is any limit to the number that can be used? A. If your battery power is increased in proportion to the number of instruments there is practically no limit to the number of instruments that may be put in the circuit.

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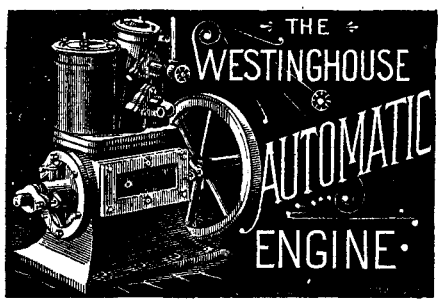

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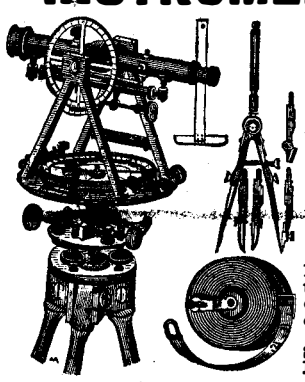

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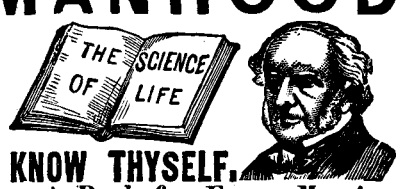

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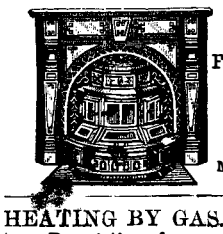

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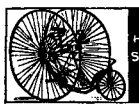

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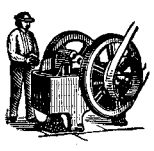

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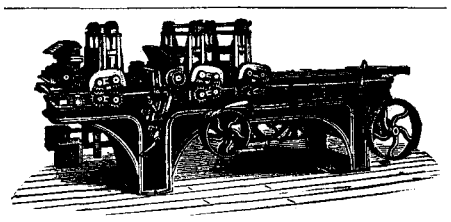

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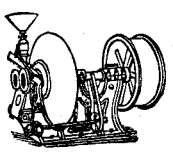

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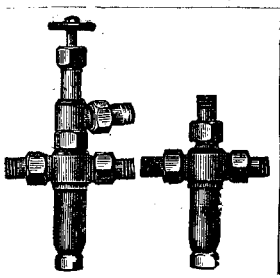

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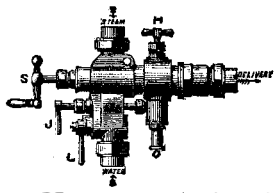

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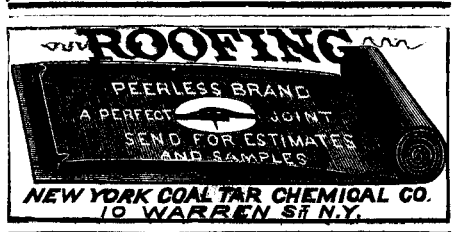

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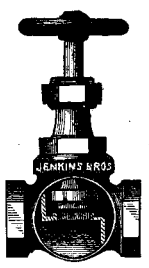

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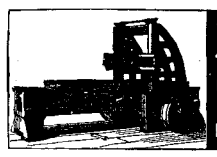

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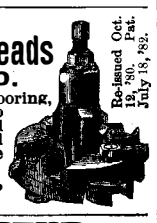

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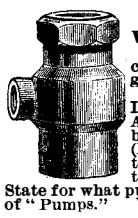

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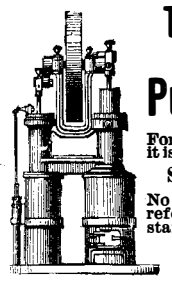

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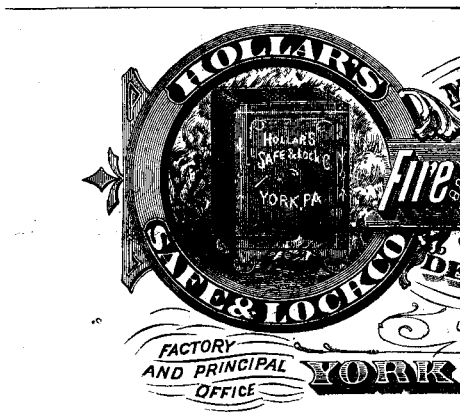

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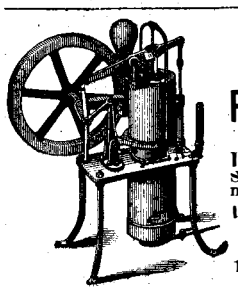

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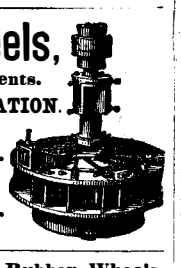

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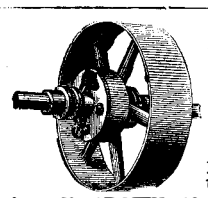

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